DOCUMENT RESUME

ED 211 198 | PS 012 568

AUTHOR	Doby, John T.; And Others
TITLE	An Empirical Investigation Into the Intellectual, Physical, Psychological, and Social Consequences of Being Reared an Only Child. Final Report.
INSTITUTION	Emory Univ., Atlanta, Ga.
SPONS AGENCY	National Inst. of Child Health and Human Development (NIH), Bethesda, Md. Center for Population Research.
REPORT NO	PB81-171993
PUB DATE	Dec 80
CONTRACT	NO1-HD-92802
NOTE	238p.
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	*Adolescents; Birth Order; Blacks; *Children; Comparative Analysis; Family Structure; *Intellectual Development; Intelligence Quotient; *Physical Development; Siblings; *Social Development; Socioeconomic Influences; Whites
IDENTIFIERS	*Only Children

ABSTRACT

Declining family size plus the widespread belief that only children experience adjustment difficulties provided the impetus for this investigation comparing the characteristics of only children with children raised in multiple-sibling families. Results indicated that being reared as an only child actually provided a slight developmental advantage over those raised with other siblings. A wide range of nation-wide physical, medical, social, and psychological data were obtained for children and adolescents. Information was gathered on background characteristics such as parents' educational levels and prenatal and natal conditions. Dependent variables included physical development, medical health, cognitive abilities, and psychological as well as social characteristics. The following conclusions were reached: (1) a simple correlation between birth order and I.Q. disappeared when background characteristics such as parental education level and family income were considered; (2) under extremely disadvantaged conditions, the I.Q. scores of blacks and whites did not differ significantly; (3) the rates of I.Q. development over time for different socioeconomic and racial groups remained stable; and (4) the I.Q. development of groups from deprived environments was associated with fewer factors than was the I.Q. development of groups from enriched environments. Appendices provide graphs, data items, and background information. (Author/DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy

PS

PB81-171993

ED211198

An Empirical Investigation Into the Intellectual, Physical, Psychological, and Social Consequences of Being Reared an Only Child

John T. Doby, et al

EMORY UNIVERSITY

December 1980

John T. Doby, Ph.D.
Project Director and Principal Investigator

Martin L. Levin, Ph.D.
Principal Investigator

S. Mitra, Ph.D.
Principal Investigator

With the assistance of:
Shailen Banerjee
James A. Mercy
Lala Carr Steelman

PS012568

Final Report
Prepared for the Center for Population Research, NICHD
Bethesda, Maryland

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED FROM THE BEST COPY FURNISHED US BY THE SPONSORING AGENCY. ALTHOUGH IT IS RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE.

3/4

50272-101

REPORT DOCUMENTATION PAGE	**1. REPORT NO.** NICHD/CPR/SBSB/81-2	**2.**	**3. Recipient's Accession No.** PB81 171993

4. Title and Subtitle
AN EMPIRICAL INVESTIGATION INTO THE INTELLECTUAL, PHYSICAL, PSYCHOLOGICAL, AND SOCIAL CONSEQUENCES OF BEING REARED AN ONLY CHILD

5. Report Date
December 1980

6.

7. Author(s)
John T. Doby, Ph.D., Martin L. Levin, Ph.D., S. Mitra, Ph.D.

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Department of Sociology
Emory University
Atlanta, Georgia 30322

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C) N01-HD-92802
(G)

12. Sponsoring Organization Name and Address
Social and Behavioral Sciences Branch
Center for Population Research
National Institute of Child Health and Human Development
Bethesda, Maryland 20205

13. Type of Report & Period Covered
Final Report
12/31/78-12/30/80

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This research was concerned with differentials in characteristics of children coming from families of varying sizes with special attention to the only child. Since most of the parents tend to believe that only children are handicapped in their development compared to children with siblings, there must be strong reasons (physical, psychological, socio-economic, etc.) for not having a second child. The study was designed to investigate the characteristics of only children compared to those reared in multiple-child families. The study was based on the Health Examination Survey (HES) data, Cycles II and III of the National Center for Health Statistics (NCHS). The findings were that: (1) A simple correlation between birth order and I.Q. development disappeared when parental education, family size, income and presence or absence of father and mother in the family were taken into account. (2) Regarding differences in mean I.Q. scores of blacks and whites, under extreme disadvantaged conditions the I.Q. scores of blacks and whites did not differ significantly. (3) Different groups experiencing a deprived environment compared to groups experiencing an enriched one showed fewer factors correlated with I.Q. development than the same types of groups in an enriched environment. (4) The rates of I.Q. development over time for different socio-economic and racial groups did not differ. This study confirmed that being reared as an only child is in no way a developmental handicap and, if anything, provides a slight advantage in today's world.

17. Document Analysis a. Descriptors

Only child
Characteristics of children
Siblings
Multiple-child families
One-child families
Single-child families
Single-parent families
One-parent/one-child families
Second child
Developmental handicap
Birth order
I.Q. development
Onlies
Family size

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: Release unlimited. Available from National Technical Information Service, Springfield, VA 22161	**19. Security Class (This Report)** Unclassified	**21.**
	20. Security Class (This Page) Unclassified	**22. Price**

(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Final Report: Contract N01-HD-92802

AN EMPIRICAL INVESTIGATION INTO THE INTELLECTUAL, PHYSICAL, PSYCHOLOGICAL, AND SOCIAL CONSEQUENCES OF BEING REARED AN ONLY CHILD

John T. Doby, Ph.D.
Project Director and Principal Investigator

Martin L. Levin, Ph.D.
Principal Investigator

S. Mitra, Ph.D.
Principal Investigator

Department of Sociology
Emory University
Atlanta, Georgia 30322
December, 1980

With the assistance of:
1. Shailen Banerjee
2. James A. Mercy
3. Lala Carr Steelman

Prepared for the Center for Population Research, NICHD
Bethesda, Maryland

TABLE OF CONTENTS

Table of Contents ii

List of Tables iv

Acknowledgments ix

Chapter 1 - Introduction 1

Chapter 2 - The Data and the Methods 5

  2.1. The Sample 5
  2.2. Identification of the Child 6
  2.3. Children who are not Only Children 7
  2.4. Data Reduction by Lancaster Scaling 8
  2.5. Multiple Regression with Dummy Variables 9

Chapter 3 - Background Characteristics 13

  3.1. Introduction 13
  3.2. Region and Size of Place of Birth 15
  3.3. Income Differentials 17
  3.4. Education of Parents 19
  3.5. Marital Status of Parents 20
  3.6. Activity Status of Parents 21
  3.7. Race and Legitimacy 23
  3.8. Summary 23

Chapter 4 - Prenatal and Natal Conditions 25

  4.1. Introduction 25
  4.2. Age Distribution by Parents 26
  4.3. Hospital or Non-Hospital Birth 29
  4.4. Length of Pregnancy 30
  4.5. Weight at Birth 31
  4.6. Summary 32

Chapter 5 - Physical Growth and Development 35

  5.1. Overall Health Status 35
  5.2. Activity Restrictions 36
  5.3. Height and Weight 38

Chapter 6 - Medical Background and General Health of the Children and Youth 44

  6.1. Introduction 44
  6.2. Data and Results 46
  6.3. Socioeconomic Status 61
  6.4. Summary 66

Chapter 7 - Cognitive and Intellectual Abilities of Only and Non-Only Children ---------------------- 68

7.1. Introduction -- 68
7.2. Hypotheses -- 73
7.3. Birth Order and I.Q. Development ---------------------- 74
(a) Cross-sectional analysis of means ----------------- 74
(b) Mean differences among siblings ------------------- 76
(c) Multivariate analysis of I.Q. development ---------- 86
7.4. Multivariate Regression Analysis of Achievement --------- 90
7.5. Effects of Levels of Parental Education on Development of Intelligence ------------------------ 96
7.6. The Longitudinal Test of the Cumulative Deficit Hypothesis --- 103

Chapter 8 - Psychological and Social Characteristics of Only Children Compared to Sibling Children --------- 113

8.1. Introduction -- 113
8.2. The Data and Variables ------------------------------- 114
8.3. Variables, Sample Size and Purpose of Analysis ---------- 115
8.4. The Data Analysis ------------------------------------ 118
8.5. Summary -- 138

Chapter 9 - Conclusions and Theoretical Implications ------------- 142

9.1. Introduction -- 142
9.2. Types of Data Comparisons ---------------------------- 143
9.3. Findings for the Cross-Sectional Sample ---------------- 145
9.4. Results of Analysis of Sibling Scores ------------------ 148
9.5. The Longitudinal Analysis ---------------------------- 149
9.6. Effects of Extreme Environmental Differences ----------- 150

Chapter 10 - Implications For Future Research --------------------- 155

10.1. Introduction --- 155
10.2. Implications --- 156

Appendix I(a) - Data Items in Cycle II ---------------------------- 159

Appendix I(b) - Data Items in Cycle III --------------------------- 172

Appendix II - Defining Birth Orders ------------------------------- 191

Appendix III(a) - Background Information Cycle II ----------------- 193

Appendix III(b) - Background Information Cycle III ---------------- 199

Appendix IV - Graphs of I.Q. and Achievement Scores --------------- 205

LIST OF TABLES

Table 3.1.1. - Sample Size by Criterion Variable (Cycles II and III) -- 14

Table 3.2.1. - Regional Distribution of the Criterion Variable (Cycles II and III) -------------------- 16

Table 3.3.2. - Percentage Distribution of Criterion Variable by Categories of Place of Residence: Cycle II ------------------------------ 17

Table 3.3.1. - Average Family Income and Per Capita Income by Criterion Variable --------------------------- 18

Table 3.4.1. - Educational Attainment of Parents (Cycles II and III) -- 19

Table 3.5.1. - Marital Status of Parents (Cycles II and III) ------- 20

Table 3.6.1. - Percentages of Parents Not Working by Criterion Variable (Cycles II and III) ----------- 21

Table 3.6.2. - Percentage of Nonworking Mothers by Marital Status and Criterion Variable (Cycles II and III) -- 22

Table 4.2.1. - Percentage Distribution of Children by Age of Father When the Child Was Born for Each Category of the Criterion Variable: Cycle II ----- 26

Table 4.2.2. - Percentage Distribution of Children by Age of Mother When the Child Was Born for Each Category of the Criterion Variable: Cycle II ----- 27

Table 4.2.3. - Median Ages of Parents at the Time of Child Birth by Birth Order: Cycles II and III ---------- 28

Table 4.3.1. - Percentages of Hospital Births (Cycles II and III) --- 29

Table 4.4.1. - Percentage of Children Born Before Fullterm of Pregnancy (Cycles II and III) ----------------- 31

Table 4.5.1. - Percentage Distribution of Children by Weight (in pounds) at Birth (Cycles II and III) --- 32

Table 5.1.1. - Percent of Children with Normal Health According to Physician: Cycles II and III -------- 36

Table 5.2.1. - Percent of Children Restricted From Hard Exercise: Cycles II and III ---------------------- 37

Table 5.3.1. - Significant Pair-Wise Differences of Ponderal and Obesity Index by Sex: Cycles II and III ---------------------------------- 39

Table 5.3.2. - Significant Comparisons Among Criterion Groups by Age and Sex --------------------------- 40

Table 6.2.1. - Parent Reported Medical Histories of Children Ages 6-11 (Cycle II) by the Criterion Variable (Values are in percents) --- 48

Table 6.2.2. - Physician Reported Medical Results from Examination of Children ages 6-11 (Cycle II) by Criterion Variable (Values are in percents) -- 51

Table 6.2.3. - Parent Reported Medical Histories of Youths ages 12-17 (Cycle III) by the Criterion Variable (Values are in percents) -------------- 53

Table 6.2.4. - Youth Reported Medical Histories of Cycle III by the Criterion Variable (Values are in percents) -------------------------------- 57

Table 6.2.5. - Physician Reported Medical Results from Examination of Youths ages 12-17 (Cycle III) by the Criterion Variable (Values are in percents) -- 59

Table 6.3.1. - Items in Which Originally Observed Distributions are Altered Under Conditions Where the Highest Parent Education is Less Than Six Years ---- 63

Table 6.3.2. - Items in Which Originally Observed Distributions are Altered Under Conditions Where the Highest Parent Education Exceeds Twelve Years ------ 64

Table 7.3.1. - Mean Wechsler Intelligence Test Scores (Normalized) for White Children Aged 6-11 By Age Order of the Children, Family Size and Parental Education of 13 or More Years ----- 77

Table 7.3.2. - Mean Wechsler Intelligence Test Scores (Normalized) for White Children 6-11 By Age Order, Family Size and Parental Education of 9-12 Years -------------------------- 78

Table 7.3.3. - Mean Wechsler Intelligence Test Scores (Normalized) for White Children Aged 6-11 By Birth Order, Family Size and Parental Education of 1-8 Years ---------------- 79

Table 7.3.4. - Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 13 or More Years ------------------ 80

Table 7.3.5. - Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 9-12 Years ------------------------ 81

Table 7.3.6. - Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 1-8 Years ------------------------- 82

Table 7.3.7. - Wechsler I.Q. Verbal Subtest Score Differences Comparing Older and Younger Siblings Aged 6-11 by Birth ------------------------------------ 83

Table 7.3.8. - Wechsler I.Q. Verbal Subtest Comparison of Differences Between Older and Younger Siblings Aged 12-17 By Birth Order ------------- 84

Table 7.3.9. - Multiple Correlation and Other Coefficients for Thirty-Two Variables with the Wechsler Verbal Subtest for Cycle II Children Aged 6-11 --- 87

Table 7.3.10. - Multiple Correlation and Other Coefficients for Thirty-Two Variables with the Wechsler Verbal I.Q. Subtest for Cycle III Youth Aged 12-17 --- 88

Table 7.3.11. - Multiple Correlations Squared for the Thirty-Two Independent Variables on I.Q. and Achievement Tests ------------------------------ 89

Table 7.3.12. - Multiple R^2 for Wechsler Verbal Subtest for Children Aged 6-11 (Cycle II) Under Varying Conditions of Family Structure ----------------- 91

Table 7.4.1. - Multiple Correlation and Other Coefficients for Thirteen Variables with the Achievement Subtest for Reading Cycle III ----------------- 92

Table 7.4.2. - Multiple Correlation and Other Coefficients for Thirteen Variables with the Achievement Subtest for Arithmetic Cycle III ---------------- 93

Table 7.4.3. - Regression Beta Weights and Corresponding F-Values for the Reading Achievement Test ---------- 95

Table 7.5.1. - Effects of Parental Education on Wechsler Verbal Scores of Children by Race ---------------- 98

Table 7.5.2. - Comparison of Effects of Selected Independent Variables on Children's Wechsler Verbal Score, Aged 6-11 When Parents' Education Was 13 Years or More or 5 Years or Less ---------- 101

Table 7.5.3. - Comparison of Effects of Selected Independent Variables on Youths Wechsler Verbal Score, Aged 12-17 When Parental Education Levels Are 13 Years or More or 5 Years or Less ---------- 102

Table 7.6.1. - Regression Analysis of Change in Intelligence and Achievement Test Scores for Blacks and Whites for the Longitudinal Sample -------------- 108

Table 7.6.2. - Regression Analysis of the Change in Intelligence and Achievement Test Scores Over Time 1 and Time 2 for the Criterion Group Using the Longitudinal Sample ------------------------- 109

Table 8.3.1. - Summary Correlation Analysis for the Reading Achievement Test: N = 4,973 Children Aged 6-11 -- 120

Table 8.3.2. - Summary Correlation Analysis for the Reading Achievement Test for Youth, aged 12-17: N = 4868 --- 121

Table 8.3.3. - Summary Correlation Analysis for the Arithmetic Achievement Test: N = 4973, Children Aged 6-11 ------------------------------ 123

Table 8.3.4. - Summary Correlation Analysis for the Arithmetic Achievement Test: N = 4868, Youth Aged 12-17 --------------------------------- 125

Table 8.3.5. - Multiple Correlation and Related Coefficients with the Dependent Variable - Time Spent Watching Television N = 4973, Children Aged 6-11 -------------------------------------- 129

Table 8.3.6. - Multiple Correlation and Related Coefficients With the Dependent Variable - Time Spent Watching Television N = 4868, Youth Aged 12-17 -- 131

13

Acknowledgments

This study was conducted under Contract Number NC1-HD-92802 with the Center for Population Research, National Center for Child Health and Human Development. We wish to express our appreciation for the splendid help and cooperation of Drs. Jerry W. Combs, Jr., Wendy Baldwin, Earl Huyck and Gloria Kamenske all at the Center for Population Research.

In addition, we are very grateful and appreciative of the excellent help provided in so many ways by the graduate assistants to the project, Shailen Banerjee, James Mercy and Lala Steelman.

Finally, special thanks are owed Dr. Rolf Bargmann, Department of Statistics, University of Georgia for his excellent statistical advice and especially for introducing us to the Lancaster scaling technqiue.

CHAPTER 1

Introduction

Fertility, on a world-wide basis, is on the decline and among industrialized nations it is approaching a zero growth rate (Westoff 1978; Westoff 1973). Easterlin (1978) noting the cyclical characteristic of fertility forecasts a return to earlier marriages and larger families. The U.S. Bureau of Census (1977) reported survey data on birth expectations among 18-24 year old women that show, among whites, almost 12 percent report "none" and about 10 percent report "one" as their expected lifetime fertility. Ryder (1979) reports that over the past 15 years the proportion of women completing their childbearing with fewer than two births has gone from 18 percent to 36 percent, accounting for approximately one-third of the decline in cohort fertility. In a recent book (Hawke and Knox, 1977) the authors state that "The time for the one-child family has come."

It is clear that with the decline of fertility in the traditional family structure, the increasing divorce rate, the increasing tendency to separate sex and reproduction, and the increasing perfection of contraception, all combine to suggest an increase in the likelihood of the one-child family and the one-parent family.

In respect to effects on fertility, Westoff (1978, p. 81) asks us to " . . . imagine the consequences for marriage and fertility of a society in which men and women are economically equal and independent." Along with increasing gender equality, the increasing separation of sex from marriage and reproduction, and the increasing economic independence of women, the future effect on fertility and the family structure may be profound. More and more women are currently opting for careers without parenthood and of those combining careers with parenthood they are doing so with fewer and fewer children. It is, therefore, important and timely to examine the consequences of having been reared an only child compared to being reared in a multiple child family.

Ryder (1979, p. 365) argues that a change in parental evaluation of children is a key point in understanding the decline in fertility. He contends that " . . . the child has come to mean little to the parent today, and the parent rather little to the child." The development of support institutions outside the family such as retirement income, retirement communities, and nursing homes have reduced the dependence of parents on offspring for protection and care in old age. Given the economic structure of modern industrial society fewer and fewer young married couples are economically able to support their parents in old age, unlike the situation in agrarian society. Nevertheless, the modern system has probably introduced a host of new problems such as bureaucracy and impersonality in the interpersonal relations involving old people. In any event, contemporary society is not the first to evaluate the cost/benefits of children. The evaluation process and consequence is, hopefully with modern contraceptive techniques, more humane today than in the past with its widespread practice of infanticide (Harris, 1977).

The increasing tendency toward the one-child family is occurring while many negative stereotypes still exist regarding the only child. These beliefs are a source of great anxiety of parents and prospective parents of only children, and therefore, the need for research to determine the consequences of being reared an only child. Terhune and Pilie

(1974) have surveyed the research literature on the only-child. They found among other findings the general belief that the only child will have great difficulty in school adjustment. A 1950 Gallup poll asked a "cross section of voters" whether being an only child is an advantage or a disadvantage. The replies showed 72 percent said "disadvantage" while 21 percent felt it was an advantage and 7 percent were unsure. More recently, a 1973 national sample of American men and women showed 71 percent of the women and 57 percent of the men believed that it "would be bad for the child" if they had only one child (Terhune and Pilie, 1974). Only children according to Messer are insecure in feeling that they cannot meet the expectations of their parents. They are likely to have problems of identity and more conflict in interpersonal relations (Messer, 1968). The title of Messer's article "The Only Child Syndrome" suggests the generally held stereotype of the only-child.

Hawke and Knox (1977, p. xi) point out that parents have been under the above kind of influence and anxiety for too long. The concern for quality of life and improved social and economic conditions for the family have stimulated parents to consider the impact of family size on family life. Accordingly, parents are beginning to ask - how many children can we have and give the kinds of opportunities we want for them? Hopefully, the research report that follows will help answer the question as to whether being an only-child is an advantage or a disadvantage.

Given the opportunity for contact outside the home today, the prevalence of the mass media, especially television, and the availability of neighborhood peers for children, logic would suggest that the family environment of the only-child might even be an advantage.

BIBLIOGRAPHY

Harris, Marvin, Cannibals and Kings, Random House, N.Y., 1977.

Hawke, Sharryl and Knox, David, One Child By Choice. Englewood Cliffs, N.J., Prentice-Hall, 1977.

Messer, Alfred A., "The Only-Child Syndrome," The New York Times Magazine, Feb. 25, 1968.

Ryder, Norman F., "The Future of American Fertility," Social Problems, 1979, 26 (3): 359-70.

Terhune, Kenneth W. and Pilie, Ronald R., A Review of the Actual and Expected Consequences of Family Size, U.S. Department of H.E.W. Publication No. (NIH) 76-779, 1974.

U.S. Bureau of the Census, 1977. "Fertility of American Women: June, 1976." Current Population Reports, Series P-20, No. 308. Washington, D.C.: U.S. Government Printing Office.

Westoff, Charles F., "Some Speculations on the Future of Marriage and the Family." Family Planning Perspectives 1978, 10 (2): 79-83, and Charles F. Westoff, ed. Toward the End of Growth: Population in America. N.J. Prentice-Hall, Inc., 1973.

CHAPTER 2

The Data and the Methods

2.1. The Sample

This study is based on the Health Examination Survey (HES) data, Cycles II and III, of the National Center for Health Statistics (NCHS), the details of which are well documented in a series of NCHS publications (1967, 1969). A wide range of physical, medical, social and psychological measures were obtained for children aged 6-11 in Cycle II between 1963 and 1965 and for youths aged 12-17 in Cycle III between 1966 and 1970. The data are nationally representative and the quality of the data is regarded as good, being based upon rigorous collection and measurement techniques.

Of the 7,427 children selected for Cycle II, the examinations could be completed for 7,119 for a 96 percent completion rate. The corresponding figures for Cycle III youths was 7,514 and 6,768 respectively for a completion rate of 90 percent. Of the 6,768 youths examined in Cycle III, 2,177 were also examined in Cycle II. A complete listing of the available data items from the two cycles may be seen in Appendixes I(a) and I(b).

During the course of our investigation, we became aware of the fact that the sampling frame included all eligible children in a given household, namely, 6-11 year olds in Cycle II and 12-17 year olds in Cycle III. Thus, given the nature of the sampling procedure, it was possible that more than one child in a family could be selected. Although the siblings were not specified as such in the data tapes, we have identified 4,250 subjects in Cycle II and 4,438 in Cycle III, each of whom had at least one sibling in the sample.

We thus have five samples from the HES data--two cross-sectional samples, one from each cycle; the longitudinal sample based on the subjects who appeared in both cycles; and two sibling samples, one from each cycle.

2.2. Identification of the Child

Since the HES were not specifically designed to study the differences between only children and children reared in multiple child families, there was no direct designation in the data identifying only children. However, an examination of the major household variables led us to the following operational definition of the presence of only children in the sample:

1. at birth, as recorded in the official transcript, the mother had no other surviving children, and,
2. at the time, the child (youth) was examined in the survey,
    a. the child (youth) resided with one or both natural parents,
    b. the parent(s) reported the examined child (youth) to be the only person under 20 residing in the household (related or non-related); and,
    c. the parent(s) reported that there were no surviving children residing outside the household.

We are aware that a small proportion of children so defined as an "only child" could have had a younger sibling who died prior to the data of examination. Unfortunately, information is not available in the data to determine the extent to which this might have been the case.

Nonetheless, it is still true that at the time of examination, the children so defined were being reared in the absence of other children.

2.3. Children who are not Only Children

For purposes of making appropriate comparisons, children who were not being reared as only children at the time of examination were idenfified by making sure that:

1. the child (youth) resided with one or both parents;
2. the parent(s) reported that in addition to the examined child, there were other children under age 20 in the household, and/or
3. the parent(s) reported that there were other children residing outside the household.

Children meeting these criteria therefore, were being reared in households containing two or more children. Specifically, we classified the children (youths) to be included in the analysis into four groups, those who were reared as:

1. the only child in a household;
2. the eldest child in a household containing two or more children;
3. neither the eldest nor the youngest child in the household;
4. the youngest child in a household containing two or more children.

It may be noted that the status only and youngest children are not necessarily invariant over time and may have changed after the HES were completed owing to the subsequent birth of a sibling.

2.4. Data Reduction by Lancaster Scaling

Both surveys contain hundreds of variables which one may wish to analyze in an investigation of the consequences of being reared as an only child. We therefore set out to determine the discriminative power of most of these variables in so far as the classification of children is concerned. We assumed that, unless otherwise warranted, those variables which failed to discriminate individually would not discriminate in combination with other variables and thus could be discarded. The technique used to determine discrimination was that of Lancaster Scaling which assigns normalized scale values to a given item in a manner that maximizes its canonical correlation with a "criterion variable," in this case a variable composed of the four groups of children. This technique is particularly useful for items which are measured at the nominal level. For ordinal and interval variables, this technique may produce different orders depending on the joint distribution of the item and the criterion variable. However, in such instances, the traditional measures of association can be used as a guide for inclusion or otherwise of an item in a multivariate analytic model.

Since the sample size is very large, we chose to use a smaller than usual critical region (.001) to reduce our list of variables. In Appendix III we have shown this reduced list for the two cycles with their values distributed by the criterion variable.

At this point, we considered two options for further data reduction and analysis of the results. One was to factor analyze the variables to find out which variables hung together and then see if the associated factor scores discriminated on the criterion variable.

Another option was to perform a discriminant analysis using the same set of variables and deal with the discriminant instead of the factor scores.

We tried both these methods and, as we guessed from the initial correlation matrix, the scores did not discriminate well among the four groups of children. We therefore decided to employ traditional cross-classification and multiple regression analysis for selected sets of dependent and independent variables. As is customary in data analysis of this magnitude we chose the listwise deletion technique to handle the missing values for the computation of the basic correlation matrix. This required that information on all variables should be available for all subjects and as a result the sample sizes were reduced to 4,974 and 4,869 in Cycles II and III respectively.

2.5. Multiple Regression with Dummy Variables

A few words about the multivariate regression analysis seems to be in order because of our involvement with nominally measured variables. Such variables are generally handled as "dummy" variables in regression analysis.

As an illustration, we may develop the multiple regression equation for the I.Q. (y) of a child and the educational achievements of the father (x_1) and the mother (x_2). Some children in the sample lived with both parents, some with just one and some lived with neither parent. Information about parental education was available or absent accordingly. Thus, we define our dummy variables:

Z_1 = 1 if father is present

= 0 otherwise

Z_2 = 1 if mother is present

= 0 otherwise

The difference among the four groups of children may then be studied by introducing the following dummy variables:

Z_3 = 1 if the child is an only child

= 0 otherwise

Z_4 = 1 if the child is the eldest

= 0 otherwise

Z_5 = 1 if the child is the youngest

= 0 otherwise

The regression equation involving all these variables is written as:

$$Y = B_0 + B_1Z_1 + B_2Z_2 + B_3Z_1X_1 + B_4Z_2X_2 + B_5Z_1Z_2X_1 + B_6Z_1Z_2X_2 +$$

$$B_7Z_3 + B_8Z_4 + B_9Z_5 + B_{10}Z_1Z_3 + B_{11}Z_1Z_4 + B_{12}Z_1Z_5 + B_{13}Z_2Z_3 +$$

$$B_{14}Z_2Z_4 + B_{15}Z_2Z_5 + B_{16}Z_1Z_2Z_3 + B_{17}Z_1Z_2Z_4 + B_{18}Z_1Z_2Z_5 + B_{19}Z_3Z_1X_1$$

$$+ B_{20}Z_3Z_2X_2 + B_{21}Z_3Z_1Z_2X_1 + B_{22}Z_3Z_1Z_2X_2 + B_{23}Z_4Z_1X_1 + B_{24}Z_4Z_2Z_2X_2$$

$$+ B_{25}Z_4Z_1Z_2X_1 + B_{26}Z_4Z_1Z_2X_2 + B_{27}Z_5Z_1X_1 + B_{28}Z_5Z_2X_2 + B_{29}Z_5Z_1Z_2X_1$$

$$+ B_{30}Z_5Z_1Z_2X_2 \quad (A)$$

Thus if we want to compare the only with the youngest child living with both parents, the equations of interest will become:

$$Y\text{ (only, both parents)} = B_0 + B_1 + B_2 + B_{10} + B_{13} + B_{16} + (B_3$$

$$+ B_5 + B_{19} + B_{21})\,X_1 + (B_4 + B_6 + B_{20} + B_{22})\,X_2 \quad (B)$$

and

$$Y \text{ (youngest, both parents)} = B_0 + B_1 + B_2 + B_9 + B_{12} + B_{15} + B_{18} + (B_3 + B_5 + B_{27} + B_{29})\, X_1 + (B_4 + B_6 + B_{30})\, X_2 \qquad \text{(C)}$$

The coincidence or parallelism or otherwise of these two and similar regressions may be tested by formulating appropriate hypotheses concerning the B coefficients. To cite another example, if one is to test the hypothesis that I.Q. depends on the presence or absence of one of both parents and their educational achievements and not on the child's status, we get a reduced regression equation involving only the first seven terms of (A), namely:

$$Y = B_0 + B_1Z_1 + B_2Z_2 + B_3Z_1X_1 + B_4Z_2X_2 + B_5Z_1Z_2X_2 + B_6Z_1Z_2X_2 \qquad \text{(D)}$$

The hypothesis may then be tested by comparing the additional variance explained by (A) over (D) against the residual in (A) by means of an F-test.

These and other standard analytic techniques have been used throughout the body of the report. But first, we would like to offer a brief description of some of the background characteristics of our subjects.

BIBLIOGRAPHY

National Center for Health Statistics: Plan, Operation and Response Results of a Program of Children's Examinations, Vital and Health Statistics, Public Health Service Publication No. 1000 - Series 1 - No. 5, Washington, 1967.

National Center for Health Statistics: Plan and Operation of a Health Examination Survey of U.S. Youths 12-17 Year of Age, Public Health Service Publication No. 1000 - Series 1 - No. 8, Washington, 1969.

CHAPTER 3

Background Characteristics

3.1. Introduction

As mentioned in the previous section, 7,119 children aged 6-11 and 6,768 youths were finally included in the HES Cycles II and III. In our attempt to identify the subject's status in the household (only, eldest, etc.), by the method described earlier, we noted that information of a number of variables crucial for purposes of such identification were not available. For example, for 399 children in Cycle II and for 589 youths in Cycle III information about these variables could not be recorded from their birth certificates. These and similar other problems resulted in a further attrition of the sample size to the amount of 568 in Cycle II and 858 in Cycle III. Table 3.1.1. gives a distribution of the criterion variable for the two cycles on the basis of the samples thus reduced.

The analyses of the data that follow in this and subsequent chapters are, therefore, based on observations which are no greater than those shown in Table 3.1.1. For some variables, further attritions of relatively small magnitude have been found owing to missing values. We shall make the customary assumption that the distributions of these missing values are random and will not significantly affect the patterns of relationships among the variables.

Since the purpose of this study is to compare and contrast the social, psychological, and physical consequences of being reared as an

Table 3.1.1.

Sample Size by Criterion Variable
(Cycles II and III)

	Criterion Variable				
Cycle	Only	Eldest	Middle	Youngest	Total
II	190	1,468	3,169	1,724	6,551
III	198	1,516	2,920	1,276	5,712

only child vis-a-vis the non onlies, it is imperative that we begin by focusing our attention on the antecedent variables that may influence the child's status in the household. A child's status, we may note, is determined not only by deliberate planning on the part of the parents but also by other non-random and random causes. Thus, when we note that less than three fourths of the only children (Cycle II, 6-11 year olds) live with both parents compared with better than five out of six non onlies, we suspect that the composition of the household is not only a determinant of the child's status but being an indicator of home environment, it may also affect the developmental processes of the only child.

We may similarly note that about two thirds of the only children live in urbanized areas compared to little more than half of their non only counterpart. Summary distributions for several such variables are given in Appendix III of which we shall select a few and provide more detailed information in this section, in view of their greater importance.

3.2. Region and Size of Place of Birth

The HES codes allow for a classification of place of residence into four regional categories, namely, northeast, midwest, south and west. The samples were distributed quite evenly among the four regions and no significant differentials were noted with respect to the distribution of criterion variable by region, other than the fact that the smallest proportion of the onlies balanced by the largest proportion of the middle borns were found in the midwest in Cycle II. The pattern is almost the same in Cycle III except for the fact that the proportion of middle borns is found to be the highest in the south. There are relatively fewer youngest children in Cycle III compared to Cycle II by almost five percentage points. This is not unexpected since, all other things remaining the same, a child aged 12-17 is more likely to have a younger sibling than a child aged 6-11.

The distribution of children and youth by birth order and by region is given below in Table 3.2.1.

Table 3.2.1.

Regional Distribution of the Criterion Variable (Cycles II and III)

Criterion Variable	Percentage in the Sample Northeast	Midwest	South	West	All
Cycle II					
Only	2.9	2.2	3.3	3.3	2.9
Eldest	25.3	22.0	19.5	22.7	22.4
Middle	44.7	50.6	49.6	48.6	48.4
Youngest	27.1	25.3	27.5	25.5	26.3
Sample Size	1,664	1,753	1,547	1,587	6,551
		(9 d.f.) = 26.6**			
Cycle III					
Only	3.7	2.6	3.2	4.0	3.4
Eldest	30.2	24.5	22.2	25.9	25.6
Middle	44.2	51.5	53.8	47.9	49.4
Youngest	21.9	21.4	20.8	22.2	21.6
Sample Size	1,419	1,585	1,448	1,458	5,910
		(9 d.f.) = 39.6**			

For the sake of brevity, we have chosen to form four categories of the places of residence, namely, 1) rural, 2) urban but not in urbanized area, 3) urban areas having population under three million and urban areas with more than three million residents. The results are given in Table 3.2.2.

Table 3.2.2.

Percentage Distribution of Criterion Variable by Categories of Place of Residence: Cycle II (Cycle III in parentheses)

Size-Class	Only Child	Non-Onlies All	Eldest	Middle	Youngest
Rural	26 (20)	32 (34)	31 (33)	34 (36)	32 (32)
Urban--					
Not in Urbanized Area	8 (11)	14 (13)	15 (13)	13 (13)	13 (13)
Under three Million	39 (34)	33 (32)	31 (31)	33 (32)	34 (33)
Three Million or More	26 (35)	21 (21)	23 (23)	20 (19)	21 (22)

The concentration of only children in urbanized areas is worth noting. Thus, two out of three among the onlies live in such areas, while the corresponding ratios among the remaining categories are virtually stable at a value slightly greater than one half. The effect of this disparity of the physical environment, if any, will be taken into consideration at the time of studying the differential development of the only and other types of children.

3.3. Income Differentials

The average income of multiple children families is somewhat less than their only children counterpart in Cycle II, causing a greater disparity between their respective per capita incomes, and the pattern remains the same for the Cycle III families. We would like to add that these per capita income figures are obtained not by averaging the per capita incomes of the sample families but by dividing the average family income by mean family size. These are shown in Table 3.3.1.

Table 3.3.1.

Average Family Income and Per Capita Income by Criterion Variable (Cycles II and III)

	Cycle II			Cycle III		
	Average Family Income	Average Family Size	Per Capita Income	Average Family Income	Average Family Size	Per Capita Income
Only	6,841	2.8	2,443	8,401	2.8	3,000
Multiple	6,764	6.1	1,109	8,319	5.8	1,434
Eldest	7,110	5.2	1,367	8,955	5.6	1,599
Middle	6,234	7.1	878	7,732	6.7	1,154
Youngest	7,449	5.0	1,490	8,912	3.9	2,285

It may be noted that the category of middle born implies a minimum of three children whereas the eldest and youngest categories include a substantial number of families with only two children. This, coupled with the fact that poor families have more children, is responsible for lower family as well as lower per capita income for the middle category.

The smaller average family size and the consequent high per capita income for the young category in Cycle III are worth noting. This is so because these children are in the 12-17 year age group, and they are also the youngest. Their siblings are all older and therefore, are more likely to have left the household in greater numbers compared to their Cycle II counterpart.

The economic advantage that the only child enjoys over other children is thus considerable. As far as we are concerned, its impact on the child's development, if any, can be studied only within the limited age-range of the two samples, that is, from childhood to adolescence. This will be taken up in later sections of this report.

3.4. Education of Parents

Very little difference is found between the two parents, in the median number of years completed in schools which is little above 11 years in both cycles. Interestingly enough, the difference between the parents of only and multiple children is also negligible and is of the order of .1 to .3 year only. The eldest and the youngest seem to have a slight edge (three percentage points) over the only and the middle children in terms of the percentage of fathers with four or more years in college. Table 3.4.1. provides these results.

Table 3.4.1.

Educational Attainment of Parents (Cycles II and III)

Criterion Variable	Median # of Years in School				Percent Fathers With 4 or More Years in College	
	Cycle II		Cycle III			
	Father	Mother	Father	Mother	Cycle II	Cycle III
Only	11.2	11.3	11.3	11.4	11	12
Multiple	11.2	11.2	11.5	11.6	13	12
Eldest	11.4	11.3	11.3	11.3	16	16
Middle	10.9	10.9	10.6	10.9	11	10
Youngest	11.2	11.2	11.2	11.2	15	14

The parents corresponding to the middle category have the lowest scores across the board. This is consistent with our earlier observations with regard to the lowest family as well as per capita incomes.

3.5. Marital Status of Parents

A larger proportion of parents of only children are divorced, widowed or separated which is responsible for an average family size of less than three (see Table 3.3.1.). A detailed distribution of the families by marital status may be seen in Table 3.5.1.

Table 3.5.1.

Marital Status of Parents
(Cycles II and III)

	Cycle II Percent of Parents			Cycle III Percent of Parents		
	Married Once	More Than Once	Divorced etc.	Married Once	More Than Once	Divorced etc.
Only	75	7	17	69	9	22
Multiple	80	11	9	75	12	13
Eldest	85	9	6	80	11	9
Middle	78	12	9	74	13	13
Youngest	80	10	10	74	11	15

The proportion of divorced, widowed, etc., increases with child's age (from Cycle II to Cycle III), and assumes its lowest value for the eldest category of children. Relatively larger proportion of these families have, by definition, younger children living in the household and thus, the proportion divorced, widowed, etc., being directly associated with child's age, is found to be minimum for this group.

3.6. Activity Status of Parents

In order to study the possible impact of the household environment as measured by the presence of a working or a nonworking mother coupled with the presence or absence of the father, we decided to first look into the empirical distribution of such households. As expected, very few fathers, but great many mothers were not working when these surveys were taken. Their distributions by the criterion variable are shown in Table 3.6.1.

Table 3.6.1.

Percentages of Parents Not Working by Criterion Variable (Cycles II and III)

Criterion Variable	Percentage of Parents not Working Cycle II Father	Cycle II Mother	Cycle III Father	Cycle III Mother
Only	4.2	55.1	7.6	46.7
Multiple	3.5	69.4	5.2	57.4
Eldest	2.1	71.7	2.5	59.9
Middle	4.2	73.0	6.3	60.3
Youngest	3.5	60.7	4.7	47.5

We would like to point out that these percentages of nonworking parents include an unknown proportion of those who were unemployed at the time and were actively seeking employment. Therefore, these percentages cannot be treated as estimates of the same as those who were outside the labor force. However, we should be able to compare the orders of magnitude of these percentages among different categories of subjects. For example, the smaller percentages of nonworking mothers in Cycle III compared to Cycle II can be explained by the fact that fewer of the Cycle III mothers had younger children to take care of and therefore could join the labor force if they wanted to. This is especially so for the mothers of only and youngest children because, by definition, they did not have any child less than 12 years of age.

The Cycle II mothers of the only and the youngest children, did not have any children under six in the household and therefore, could be found working in greater proportions than other categories of mothers. The mothers of the only children had the added advantage of a smaller household size and consequently had more time to spare which is reflected in the smallest proportion of nonworking mothers for this category.

Marital and activity statuses of women are known to be largely associated with one another. The differentials in this relationship among mothers of different categories may be seen in Table 3.6.2.

Table 3.6.2.

Percentage of Nonworking Mothers by Marital Status and Criterion Variable (Cycles II and III)

	Cycle II Percentage of Nonworking Mothers who are		Cycle III Percentage of Nonworking Mothers who are	
Variable	Married	Widowed, Divorced, Separated	Married	Widowed, Divorced Separated
Only	63.0	30.0	53.2	22.0
Multiple	70.6	51.0	58.5	43.3
Eldest	73.1	44.2	61.4	43.0
Middle	74.1	63.7	61.3	52.6
Youngest	62.7	42.2	50.1	31.8

As expected, there are fewer nonworking mothers in Cycle III than in Cycle II for both marriage categories. Also for both cycles, the percentages of nonworking mothers are considerably higher among married women. The smallest percentages for the mothers of the only and the youngest children should also be noted for the two marriage categories of the two cycles.

3.7. Race and Legitimacy

Our sample is almost 90 percent white as one would expect from a nationally representative sample. We also found that only one child in Cycle II and six children in Cycle III had black fathers and white mothers. Consequently, we considered the issue of mixed marriages as nonexistent and took race of the child (not of his parents) as sufficient for studying racial differences where appropriate.

We also looked into the advisability of examining the importance of legitimacy in this study. However, it was found that the information was not available for more than a third of our sample subjects. Therefore, we had no choice but to exclude legitimacy from our list of important analytical variables.

3.8. Summary

Less than three fourths of the only children are found to be living with both parents (73% in both Cycles II and III), compared with a much higher proportion of the nononlies (86% and 81% in Cycles II and III respectively). As expected, the proportion of nonworking mothers is higher among married women and less among mothers of only children in all marriage categories.

The concentration of only children in urbanized areas is worth noting. While two out of three among the onlies live in such areas, the corresponding ratio among the remaining categories is slightly greater than one half.

The average income of multiple children families is slightly less than that of their only children counterpart in both cycles. However, the per capita income of the multiple children families works out to be less than one half of that of the only child families. The median number of years in school is found to be virtually the same for both parents in both cycles for all categories of children (slightly over 11 years). This probably explains why the difference in average income between the family types is so small.

This and other background variables have been selected in view of their possible differential impact on the growth and development of the different categories of children. Of these, mother's activity status turns out as one of the less important variables and as a result has been dropped from subsequent analysis in the latter chapters. It seems that the dollar amount of income, in the present context, is more important than who earns it.

CHAPTER 4

Prenatal and Natal Conditions

4.1. Introduction

In this chapter we continue our investigation of the background characteristics of our sample subjects with primary focus on variables associated with the birth of a child. As before, the purpose is still to find out if there were antecedent variables in this category, that were both determinants of the child's birth order status in the household, and in that sense were contributors to the developmental process of the child as he grew older. For example, one may hypothesize that the first experience of parenthood contributes greatly to the decision making process of further child bearing. The problems prior to as well as during pregnancy, available health care facilities, child's health at birth are important variables in this regard. In connection with the latter, we may hasten to note that very few of these children were noted to have congenital malformations in our samples. This was not unexpected because children with this type of problem were, in all likelihood, institutionalized and hence were not included in the sample. Our sample thus represents a population of reasonably healthy children and, therefore, we did neither anticipate nor find more than an insignificant proportion of abnormalities associated with child birth.

A close look at Appendix III, however, reveals a few variables which showed moderate to significant discrimination of our criterion variable. Some of these variables have been selected for an in-depth analysis in this chapter.

4.2. Age Distribution by Parents

Age of parents is one such variable. When most other variables are held constant, age of parents being a measure of maturity, can be expected to have an effect on the rearing and subsequent development of the child.

The median ages of parents shown in Tables 4.2.1. and 4.2.2. reveal that the fathers of only children are older than those of the eldest children by 5.7 years in Cycle II and 7.3 years in Cycle III. Similarly, the mothers of the only children are older than those of the eldest children by 6.5 years in Cycle II and 7.6 years in Cycle III.

Table 4.2.1.

Percentage Distribution of Children by Age of Father
When the Child Was Born for Each Category
of the Criterion Variable: Cycle II
(Cycle III in Parentheses)

Age of Father	Only Child	Non-only Child			
		All	Eldest	Middle	Youngest
Under 20	5 (3)	5 (5)	15 (14)	2 (2)	1 (1)
20-24	17 (14)	17 (18)	36 (33)	15 (15)	5 (4)
25-29	25 (23)	29 (30)	31 (32)	33 (34)	20 (19)
30-34	20 (18)	24 (24)	12 (14)	27 (27)	30 (29)
35-39	18 (24)	14 (14)	5 (5)	13 (13)	23 (27)
40+	15 (18)	11 (9)	2 (2)	9 (9)	21 (20)
TOTAL	100	100	101	99	100
Median Age	30.6 (32.7)	29.9 (29.6)	24.9 (25.4)	29.9 (29.7)	34.1 (34.5)

Table 4.2.2.

Percentage Distribution of Children by Age of Mother When the Child Was Born for Each Category of the Criterion

Variable: Cycle II
(Cycle III in Parentheses)

	Only		Non-only Child		
Mother	Child	All	Eldest	Middle	Youngest
Under 20	15 (11)	15 (16)	40 (38)	11 (11)	3 (3)
20-24	22 (15)	25 (24)	34 (32)	27 (26)	12 (10)
25-29	23 (27)	28 (30)	18 (21)	34 (36)	26 (27)
30-34	19 (25)	20 (18)	5 (7)	20 (19)	32 (32)
35-39	17 (17)	9 (9)	2 (2)	7 (7)	19 (20)
+40	4 (5)	3 (2)	0 (0)	1 (1)	8
TOTAL	100	100	99	100	100
Median Age	27.9 (29.5)	26.7 (26.6)	22.0 (24.4)	26.8 (26.8)	31.3 (31.4)

Thus, at the time of birth, the parents of the only child are considerably older than those of the eldest in families where more children were born subsequently. In fact, even the median ages of both parents in multiple child families, averaged over all birth orders are found to be smaller than their counterparts with an only child.

We may add that the aforementioned comparisons are, to some extent at least, confounded by the number of children born in the household. In particular, the findings with respect to the middle and the youngest children are affected most by the variability in the family size. This is so because a middle child may be the second born to mothers who have given birth to at least three children, the third born to mothers who have borne at least four children, and so on. Similarly, the youngest child may be the last born of two, three, etc. children. An examination of the parental age distributions by child's birth order reveals the information summarized in Table 4.2.3.

Table 4.2.3.

Median Ages of Parents at the Time of Child Birth
by Birth Order: Cycles II and III

Birth Order	Median Age of Father		Median Age of Mother	
	Cycle II	Cycle III	Cycle II	Cycle III
1 only	30.6	32.7	27.9	29.5
Eldest	24.9	25.4	22.0	22.4
2	28.4	28.4	25.1	25.1
3	30.9	30.9	27.8	27.8
4	32.5	32.4	29.3	29.1
5	34.2	34.5	31.2	30.5
6	35.6	35.9	32.0	31.7
7 and above	35.6	36.2	32.4	32.3

The increasing trend in the median ages of both parents seems to be consistent in both cycles. The compounding effect of birth order suspected earlier appears to be minimal in view of the figures shown in Table 4.2.3.

We would like to note that Cycle III parents of only children are older than those in Cycle II by about two years. This is expected in view of a somewhat larger probability for the younger parents of only children aged 6-11 in Cycle II to experience parenthood more than once.

4.3. Hospital or Non-Hospital Birth

A comparison of the lengths of the survey periods and the children's age reveal that the Cycle II samples came from the 1952-1959 birth cohorts while those included in Cycle III were drawn from the 1949-1958 birth cohorts. An increase from 90 to 93 percent or about three percentage points in the proportion of births taking place in the hospital over a short interval of time (two years if one takes the difference between the mid points of the two periods), is worth noting. Incidentally, the figure went up to 98.7 percent in 1975 (National Center for Health Statistics, 1978).

Table 4.3.1.

Percentages of Hospital Births
(Cycles II and III)

Criterion Variable	Percent of Babies Born in Hospital Cycle II	Cycle III
Only	95	94
Non-only	93	90
Eldest	97	95
Middle	90	87
Youngest	95	93

Although compared with the non onlies, slightly larger proportions of the only children are found to be born in hospitals, the difference is primarily accounted for by a substantially lower proportion of hospital birth among the middle-born categories.

It seems that the conditions that prevented the few from seeking the type of assistance that the hospitals can provide, like low income, inadequate transportation facilities, etc., were perhaps more prevalent among parents of many children which, in our example is largely represented by the middle-born category.

4.4. Length of Pregnancy

In so far as the first experience of motherhood is concerned, only children are like the eldest borns if all other variables could be held constant. However, some of these variables like the mother's age at the time of childbirth, age at marriage, etc., are known to be differentially distributed for the types of children selected for this study. We have earlier reported that the age of motherhood for only children was considerably larger than that for the eldest born. One may suspect that the onset of first pregnancy at an advanced age may be associated with some abnormalities that might become manifest in differential lengths of pregnancy. Remembering however, that we are dealing here with the population of noninstitutionalized children in the age group 6-17, we may not expect to find a significant proportion of premature birth histories among any group of children. This is confirmed by the table that follows:

Table 4.4.1.

Percentage of Children Born Before Fullterm of Pregnancy (Cycles II and III)

Criterion Variable	Percent Born Before Fullterm: Cycle II Less Than 35 Weeks	Cycle II Less Than 38 Weeks	Cycle III Less Than 35 Weeks	Cycle III Less Than 38 Weeks
Only	2	8	2	5
Multiple	2	8	1	7
Eldest	2	7	2	8
Middle	2	10	1	7
Youngest	2	8	1	8

The incidence of prematurity (birth within 25 weeks after conception) is nil in our sample. In fact, none of these children is born before 30 weeks after conception. As we had anticipated, the distribution shown in Table 4.4.1. does not show any difference among the different groups of children.

4.5. Weight at Birth

The lack of differentials in the length of pregnancy between the onlies and the others led us to suspect that the weight at birth may not turn out to be a significant discriminating variable either. This is confirmed by Table 4.5.1. in which we find very little difference in the median weights of these children.

Table 4.5.1.

Percentage Distribution of Children
by Weight (in pounds) at Birth
(Cycles II and III)

	Birth Weight							
	Cycle II				Cycle III			
Criterion Variable	6	6-8	8+	Median	6	6-8	8+	Median
Only	13.2	67.3	19.4	7.1	14.9	59.5	25.6	7.3
Multiple	10.1	60.4	29.5	7.4	10.8	60.7	28.5	7.4
Eldest	10.0	66.2	23.8	7.3	12.8	66.8	21.4	7.2
Middle	9.4	59.5	31.2	7.5	9.8	58.7	31.6	7.5
Youngest	11.1	56.5	32.3	7.5	10.1	59.5	30.4	7.4

It seems that the first child is born slightly lighter than his younger siblings. This may perhaps be explained by the uterine hypothesis (Bayer, 1967) in the sense that the first born experiences greater hardship in making room for himself in the mother's womb and, therefore, is likely to be smaller than others. In so far as the present study is concerned, the smallness of the difference suggests that the weight at birth may be taken into consideration for analyzing subsequent differentials in physical, mental and other developments, regardless of birth order.

4.6. Summary

Remembering that our sample represents the population of school-going and, therefore, of reasonably healthy children, we did neither anticipate nor find significant differences in variables that are associated with childbirth, among the categories of children (only vs. non-only) selected for this study.

More than 90 percent of the children are born in hospitals. The contrast between the eldest (97 percent) and the middle born (90 percent) children in Cycle II is worth noting. The corresponding percentages in Cycle III are 95 and 87 respectively. Very few children have records of premature births and, therefore, the distributions by weight at birth are virtually free from abnormalities for all categories of children.

The age distributions of parents at the time of childbirth show some interesting differences. Parents of only children are considerably older than those of the eldest children. The differences between the median ages of fathers of these children are 5.7 years in Cycle II and 7.3 years in Cycle III. For the mothers, the corresponding figures are 6.5 and 7.6 years respectively.

BIBLIOGRAPHY

Beyer, A. E., 1967, "Birth order and Attainment of the Doctorate: A Test of Economic Hypothesis, American Jouranl of Sociology, Vol. 72, pp. 540-550.

National Center for Health Statistics: Characteristics of Births, United States, 1973-1975. Vital and Health Statistics. PHS pub. No. 78-1908 - Series 21 - Vol. 30. Public Healths Service. Washington, U.S. Government Printing Office, Sept. 1978.

48

CHAPTER 5

Physical Growth and Development

5.1. Overall Health Status

As one would expect, the health examination survey data contain measurements on virtually every indicator of health which makes it possible to assess not only the subject's current status of health but also his physical growth and development up to that point in his life. Since our primary objective has been to look for differentials among the only and the other categories of children, we first examined their respective distributions for between group differences. This procedure showed that most of these health indicators that are meaningful to lay persons, could not discriminate among these groups of children. Some of the findings that are of general interest are, however, included in Appendix Table I regardless of the results of the tests of statistical significance. Table 5.1.1. showing the overall health status, has been extracted from that source.

The Cycle II only children seem to have a slight edge over the non-onlies although that difference is not statistically significant. Also evident is the rapid deterioration of the health conditions with age as indicated in Cycle III, the corresponding measures decline by about ten points for the non-onlies and by a surprising seventeen points for the onlies. The net effect of this change is a reversal of the direction of the difference between the measures of well being of these two groups. The difference between the onlies and the rest, although larger in

Table 5.1.1.

Percent of Children with Normal Health According to Physician: Cycles II and III

Criterion Variable	Percent with normal health Cycle II	Cycle III
Only	90	73
Non-only	88	78
Eldest	88	79
Middle	87	78
Youngest	89	78

magnitude in Cycle III than in Cycle II, is still not statistically significant. It is not clear why the well-being indicators are lower for the youth than for the children.

5.2. Activity Restrictions

A somewhat related measure of general health of children in a society is provided by the proposition of children who are restricted from hard exercise. Although all of these children are included in the group whose overall health conditions were evaluated as not normal, not all of those with some form of abnormality were restricted from normal activities. Therefore, we have decided to analyze the differentials in activity restrictions for the criterion groups, in spite of the insignificant differences in general health conditions noted earlier. Table 5.2.1. provides the necessary figures.

Table 5.2.1.

Percent of Children Restricted From Hard

Exercise: Cycles II and III

Criterion Variable	Percent restricted from hard exercise Cycle II	Cycle III
Only	10	14
Non-only	6	12
Eldest	6	13
Middle	5	10
Youngest	6	12

With the deterioration of health conditions by age, as documented earlier, we can anticipate higher proportions of restricted activity in Cycle III compared to those in Cycle II. The increases are substantial for all categories of children, though somewhat less for the only children in relative terms.

The only children top the list in both cycles but the differential which is significant in childhood, is reduced to statistical insignificance in adolescence. It is possible that on the one hand, the physical impairments of some of these children may have contributed to their parents decision to have no more children. On the other hand, divided parental attention in multiple child families may have been responsible for a larger proportion of such children's contracting debilitating conditions later in life.

We may thus conclude that although the general health of a child may be determined by a host of factors, the status of the child as defined by our criterion variable is certainly not one of them.

5.3. Height and Weight

Next, we turn our attention to standard measures of physical development like height and weight in order to find out differentials in their distributions among the criterion groups. Since for children and adolescents both of these measures are correlated with age and possibly with sex, we have controlled for the variations of these variables before making any meaningful comparison. We have also looked for measures that are based on a combination of height and weight, are independent of age and sex and as such, can be used as an index of general health.

Two such measures have come to our attention. One, used earlier by the National Center for Health Statistics (1974) and known by the name of ponderal index, is defined simply as height/(weight)$^{1/3}$. It is apparent from the definition that high ponderal indexes suggest linearity (thinness) of physique, while low indexes suggest latuality (obesity). The other index was designed by Durant, et. al. (1980) to measure obesity, herein called an obesity index. For the derivation of this index, one first computes the ratio of the actual weight to actual height, say A, and the ratio of the 50th percentiles of expected weight to the same for expected height, say B, for any given age. The obesity index is then expressed as $I = 100(A/B)$, so that those who have normal weight in relation to height will have their index values closer to 100. In fact, the authors of this index suggest to regard those with $I < 90$ as underweight, $90 \leq I < 109$ as normal, $110 \leq I \leq 119$ as overweight and $I > 120$ as obese.

Both the ponderal and the obesity index have been constructed from our data to study the differentials along with the basic variables height and weight. It is easy to see from the definitions of the two indexes that there is an inverse association between the two because slimmer people will score higher in the ponderal and lower in the obesity index and vice versa.

Since the indexes are independent of age we can compare the average values for the four criterion groups. These, done separately for the two cycles, generate a few significant pair-wise differences as shown in Table 6.3.1.

Table 5.3.1.

Significant Pair-Wise Differences of Ponderal and Obesity Index by Sex: Cycles II and III

Item	Sex	Difference	Cycle
Ponderal	Male	Eldest-only	II*
		Middle-only	II*, III
		Middle-youngest	II
	Female	Middle-Youngest	II
Obesity Index	Male	Only-middle	II, III
		Youngest-middle	II, III
		Eldest-middle	II, III*
	Female	Youngest-middle	II
		Eldest-middle	II

*Significant at 5% level. All other differences in the table are significant at 1% level.

The differences are indicated in a manner so that they are always positive. That explains the reversal between the two measures since they are inversely related. For each index, one can make six pair-wise comparisons separately for each sex and each cycle. The significant comparisons have been identified by Duncan's (1955) multiple range test. Although no conclusion can be drawn about only children being different from the non-onlies, the same does not seem to be true for the middle children. They stand out to be the slimmest among all children. This is probably related to their being in larger families and from lower socio-economic families.

For the height and weight measures, we studied similar comparisons by age and sex.

Table 5.3.2.

Significant Comparisons Among Criterion
Groups by Age and Sex

Item	Sex	Age	
Height	Male	11	Youngest-middle
Weight	Male	13	Eldest-middle
		9	Only-middle** Eldest-middle Youngest-middle
Height	Female	8	Youngest-middle
		11	Youngest-middle
Weight	Female	8	Youngest-middle
		11	Youngest-middle Youngest-middle

**Significant at 1% level. All other differences in the table are significant at 5% level.

We may note that six pair-wise comparisons can be made among the four criterion groups. If these are made separately for each age (6-17), sex (male, female) and item (height and weight) combination, 288 comparisons can be made. Of these, nine turned out to be significant in our example, one at 99% level and remaining eight at 95% level of significance (see Table 5.3.2). By definition, we may expect to find three significant comparisons at 99% level out of 300 comparisons simply by chance even when there is no difference in the population. At 95% level, the same number would be 15. Accordingly, we may not emphasize the findings reported in Table 5.3.2., except to note the fact that the middle child is invariably the lower ranking member of the pair.

These findings preclude any additional investigation leading to significant differentials among criterion groups with respect to these physical variables. Of course, we have run a few multiple regression analysis on these variables controlling for socio-economic status and other independent variables simultaneously without analysis of the averages reported earlier in this chapter. Needless to say, these analyses did not reveal any difference between the only children and the rest. Our search for differentials with respect to a few other variables like skinfold and grip strength did not bring any surprise either.

5.4. Summary

As noted in earlier chapters, the sample of children used for the study were earlier selected for the health examination survey from school going children. Naturally, most of the children are expected to be in reasonably good health and there seems no reason to anticipate significant differences between the only and the non-only children. According to the overall report submitted by the physicians, 90 percent of the only children and 88 percent of the rest of the Cycle II sample (6-11 year olds) have normal health. The same percentages for the Cycle III (12-17 year olds) subjects were 73 and 78 respectively which shows a reversal in the direction of the differential and an increase in the magnitude of the difference, albeit statistically non-significant. The deterioration in health conditions with age is worth noting.

If the groups do not differ with respect to the states of their health they should show no significant difference with respect to activity restrictions, a variable we have also looked into. As the proportion of children with normal health declines with age, the percentage restricted from hard exercise increases from ten to sixteen for only children and from six to twelve for the rest.

An examination of the variables like height, weight, ponderal and obesity index revealed a slight tendency for the middle child to be slightly short, light-weight and less obese compared to some of the other categories of children. The differentials are particularly significant for the two measures of obesity and more so among the males. It is possible that these differentials are confounded with differences in family size and with associated differences in standards of living among these family groups. Ideally, such hypothesis can be tested by between sibs or within family comparisons of relevant statistics collected for that specific purpose.

BIBLIOGRAPHY

Duncan, D. B., 1955, Multiple Range and Multiple F Tests. Biometrics, Vol. II, pp. 1-42.

Durant, Robert H., D. S. Martin, C. W. Linder and W. Weston, "The Prevalence of Obesity and Thinness in Children from a Lower Socioeconomic Population Receiving Comprehensive Health Care," The American Journal of Clinical Nutrition, Vol. 33, Sept. 1980, pp. 2002-2007.

National Center for Health Statistics: Body Dimensions and Proportions, White and Negro Children 6-11 Years, U.S. Vital and Health Statistics Series 11, No. 143, DHEW Publication No. (HRA) 75-1625, U.S. Department of Health Education and Welfare, Public Health Service, December 1976, U.S. Government Printing Office, Washington, D.C.

CHAPTER 6

Medical Background and General Health of the Children and Youth*

6.1. Introduction

This chapter deals with the medical background of the only child in comparison to sibling children. Responses from several questions that are specifically geared to depict the child's medical history are reviewed. Only children are compared to eldest, middle and youngest children. Although this breakdown of the criterion variable is not as refined as that used in later sections, it provides some useful information. If only children differ from eldest, middle and youngest children, this difference may be a function of family size in relation to socio-economic status variables. But if only children differ just from middle and and youngest children and not from the eldest children, this difference may be a function of birth order rather than family size. This makes sense because both eldest and youngest children typically come from family sizes that are roughly equivalent. In this chapter, the health of the only child is contrasted to these sibling children. In order to make this comparison, percentage differences are taken from cross-classification tables. Specific indicators of a subject's health status are obtained from data from the Health Examination Survey (NCHS 1967, 1969).

---

*We wish to acknowledge the able assistance of Lala C. Steelman, who prepared the first draft of this chapter.

Why might the only child be distinct from other children in regard to its physical health? There are several plausible answers. First, the only child might be overrepresented in the ranks of unhealthy children. Parents possibly overprotect only children by preventing them from exercise and play and thus, limiting their physical growth and improvement. It is also possible that more parents of unhealthy or handicapped children choose not to have additional children than parents of healthy children, particularly if the child has a handicap. Sick children require much care and money to meet their treatment or special service needs. Couples who have children with genetically based problems may be advised not to have more children.

By the same token, the only child may be more likely to land into the healthier category than sibling children for several reasons. As noted in an earlier section, the only child is more likely to live in a high socioeconomic household than sibling children. The relation between social class and health is a well-known and consistent pattern observed by medical sociologists. The relation is direct; those from the upper stratum are more likely to enjoy the benefits of good health while those in the lower stratum are more likely to suffer the consequences of poor health. But even if the only child is equally likely as sibling children to reside in a high socioeconomic household, it would still be more likely to receive more resources and attention than sibling children precisely because it has no siblings to compete with for these advantages. Furthermore, parents of only children may be more likely to practice preventive medicine on their children than parents of sibling children--doing things like getting vaccinations and going for regular check-ups. Such positive health practices possibly eventuate in better health for the only child.

6.2. Data and Results

Tables 6.2.1. - 6.2.5. present the data for the analysis. Table 6.2.1. shows the health indicators as provided by parents about their children in Cycle II. Items taken from the physician's evaluation for these children are depicted in Table 6.2.2. Table 6.2.3. reveals the parental appraisal of youths' health, while Table 6.2.4. displays the youth's appraisal of his/her own health. Table 6.2.5. shows the physician's evaluation of the youth's health broken down by the criterion variable. The latter three tables which represent youths are taken from Cycle III.

The indicators presented in the following tables do not lend themselves to easy interpretation. For example, parents were asked several questions about the health of their children. It would not be surprising if the parents of only children were more anxious about the health of their youngsters than parents of multiple children. This difference may slant the results and imply that only children are unhealthier than the rest when they are not from an objective standpoint. Thus, it was decided to separate the responses that are provided by the physician from the responses provided by the parent and to compare the results. Since the physician did not know the examined child on a personal basis, results taken from the medical examination should be more objective than results taken from the parent interview. The data are broken down to compare the physician evaluation to that of the parents.

From Table 6.2.1. the reader should see that only children are more inclined than sibling children to experience bumpy medical roads during infancy. Both the only child and its mother are more likely to spend a week or more in the hospital after birth than others. Parents of only children are more likely to report that something was wrong with the child as a baby and that medical complications occurred during the pregnancy that led to its birth. However, the mother of the only child was also more likely than her counterparts to seek medical care during the first trimester of the pregnancy. Even though the first year for the only child seems rough, this initial setback appears to be surmountable over time since parents report that the only child at interview time was in very good health at a rate similar to parents of sibling children. Despite this similarity, more parents of only children express that there is a current health problem that worries them now compared to parents of sibling children. Viewed overall, the results suggest that only children may have more problems during infancy than other children, but that they probably outgrow this with maturity. In any case, the percentage differences that separate only children from other children are small. Nevertheless, this initial lag and the fact that they are only children represent two sources of potential anxiety to the parents.

In terms of experience with diseases and other medical problems like broken bones, only children and sibling children are very similar except that only children showed a greater frequency of heart murmur. What is not known is if the only child is actually more likely to have a murmur or is simply more closely monitored than other children and thus, more prone to diagnosis of such conditions. The only child, for

Table 6.2.1.

Parent Reported Medical Histories of Children Ages 6-11 (Cycle II) by the Criterion Variable

(Values are in per cents)

	Only	Eldest	Middle	Youngest
1. Percent born in hospital	95	97	90	95
2. Mother's stay in hospital was one week or more	12	8	5	10
3. Infants stay in hospital was one week or more	16	11	9	13
4. Percent baby arrived when expected	72	62	74	69
5. Percent something wrong with baby	12	8	7	8
6. Percent mothers had medical problems during pregnancy	16	13	12	14
7. Percent of mothers sought prenatal care during first trimester	71	69	54	67
8. Percent in good health at one year of age	91	93	90	90
9. Percent anything wrong with child as a baby	21	15	13	16
10. Percent seen about doctor in regard to question 9.	97	99	98	99
11. Percent breast fed	27	39	35	26
12. Percent breast fed over six months	10	7	9	7

	Only	Eldest	Middle	Youngest
13. Percent listed child's present health as very good	57	57	50	52
14. Percent expressing that child has current health problem that worries parent	28	19	19	19
15. Percent sucked thumb	11	9	11	9
16. Percent broken bones	7	9	7	9
17. Percent knocked unconscious	2	4	4	3
18. Percent with heart murmur	10	4	4	3
19. Percent had a convulsion	4	4	3	3
20. Percent had measles	82	85	89	85
21. Percent had crossed eyes	2	2	3	2
22. Percent had an eye operation	2	1	1	1
23. Percent had other eye trouble	15	15	11	12
24. Percent wear glasses or contact lenses	12	13	10	10
25. Percent still have trouble doing fine work or reading if wear glasses	7	5	5	3
26. Percent have hearing trouble	5	5	4	3
27. Percent have talking problem	4	5	10	8
28. Percent have exercise ever restricted because of health	10	6	5	6
29. Percent been to dentist in past year	72	67	53	67

instance, is more likely to have gone to the dentist during the past year than other children and this may reflect more frequent check-ups. Yet the only child's parent is more likely to report that their child has been restricted from hard exercise because of health related problems. Taken together, the distributions from the parent interview suggest that the only child is at a slight disadvantage in terms of its health.

Table 6.2.2., however, suggests that the only child does not appear different from others on the physician evaluation. The only child, according to the examining physician, is slightly more likely to bite nails or suck fingers than sibling children. Both of these items probably mirror the extent of a child's anxiety or tension rather than real health difficulties. Observe that on all of the other items, the only child does not seem at a disadvantage. On serious health indicators, the probability of any child in this sample being inflicted is low. Furthermore, the likelihood of having any of these serious problems does not seem to relate significantly to whether the child is an only, eldest, middle or youngest child. Many of the items from the parent questionnaire may (given the physician evaluation) mirror the concern of the parents for the well-being of the only child rather than objective health differences.

In Table 6.2.3., the parent report on the health of youths is shown. Again, notice that in question three the parent of the only child is more likely than the parent of sibling children to remember that their child had health difficulties during the first year of life. However, unlike the results from Cycle II, the parents of these only children are less

Table 6.2.2.

Physician Reported Medical Results from Examination of Children ages 6-11 (Cycle II) by Criterion Variable

(Values are in percents)

	Only	Eldest	Middle	Youngest
1. Percent with tics or mannerisms	4	4	4	5
2. Percent who suck fingers	6	3	3	4
3. Percent who bite nails	26	23	22	22
4. Percent with breast development	28	30	24	23
5. Percent with normal eyes	90	90	87	89
6. Percent with 120+ systolic blood pressure	15	16	13	15
7. Percent with 75+ diastolic blood pressure	17	15	14	15
8. Percent with normal neuromuscular and joint summary	96	96	96	96
9. Percent with normal extremeties	96	96	96	96
10. Percent with normal ECG	95	96	95	96
11. Percent with normal x-ray	97	98	97	97
12. Percent with a heart condition	9	8	6	6
13. Percent with normal right ear	97	98	99	98

	Only	Eldest	Middle	Youngest
14. Percent with normal left ear	97	98	98	99
15. Percent who have an abnormal overall evaluation	8	10	12	11
16. Percent with accidents or injuries	0	2	2	2
17. Percent with heart disease	3	2	2	2
18. Percent with neurological, joint or muscular condition	3	3	3	3
19. Percent with other congenital abnormalities	2	2	3	3
20. Percent with other major diseases	1	4	3	3
21. Percent with gingivitis and periodontal pockets not detected by dentist*	50	52	48	51

*Dental information is included along with the physician's exam because both are trained medical personnel.

Table 6.2.3.

Parent Reported Medical Histories of Youths ages 12-17 (Cycle III) by the Criterion Variable

(Values are in percents)

	Only	Eldest	Middle	Youngest
1. Percent born in hospital	94	95	87	93
2. Percent of mothers with problems during pregnancy or delivery	14	14	8	12
3. Difficulty with child under one year percent of	17	13	10	12
4. Percent of children with serious health problem since one year	14	13	12	12
5. Percent with health problem that worries parent now	12	15	15	14
6. Percent with very good or excellent health now	72	71	62	72
7. Percent with broken bones	22	19	17	18
8. Percent with serious accidents or injuries	15	12	12	12
9. Percent ever been unconscious	7	9	9	9
10. Percent hospitalized overnight or longer	63	56	46	51
11. Percent had measles	91	94	93	90
12. Percent had mumps	53	67	66	60

	Only	Eldest	Middle	Youngest
13. Percent had chickenpox	78	89	83	83
14. Percent had whooping cough	12	9	17	13
15. Percent had scarlet fever	4	6	4	4
16. Percent had asthma	6	7	6	5
17. Percent had hay fever	17	13	7	8
18. Percent had allergies	20	18	10	12
19. Percent had kidney trouble	5	5	4	4
20. Percent with heart murmur or anything else wrong with heart	7	6	4	4
21. Percent had fit, convulsion or seizure	4	4	3	3
22. Percent had pneumonia	11	13	11	10
23. Percent had diabetes	0	0	0	0
24. Percent had polio	0	1	1	1
25. Percent have epilepsy	1	0	0	0
26. Percent wet bed during past year	2	4	6	3
27. Percent wears glasses	36	36	29	34
28. Percent any eye operations	3	2	2	1
29. Percent had ear injury	3	4	4	3
30. Percent had ear drums opened or lanced	5	4	3	3
31. Percent had running or discharge from ears	7	10	9	8
32. Percent with difficult hearing	5	3	4	3

	Only	Eldest	Middle	Youngest
33. Percent with speech defects	3	4	5	4
34. Percent had exercise or hard playing restricted because of health	14	13	10	12
35. Percent had teeth straightened or braces (bands)	21	14	6	13
36. Percent overweight	20	12	11	15

likely than other parents to report that their children have health concerns that worry them now. Also, middle children are the least likely group to have excellent health according to their parents.

Turn now to the list of diseases and other medical dilemmas that befall children. It is noteworthy that only children experience these problems at the same or at lower rates than other children with the notable exception of hay fever. Hay fever is not a serious malady and may have a psychosomatic basis. The other percentage differences taken from health indicators are not striking. The only child is more likely than others to have spent the night in a hospital, but this may be related to other factors outside health such as family resource level. Whatever the reason for being in the hospital, the only child's present health status does not seem affected.

Table 6.2.4. depicts the youth's responses to questions about his/her health. Again, the likelihood of having spent the night in a hospital is borne out. In addition, the only child seems more apt to view him/herself as overweight than sibling children. This finding corresponds with results shown in Table 6.2.3., in which the parents of only children also indicated that their child is more likely to be overweight than sibling children. According to Table 6.2.4., only children are not distinct from other children in their frequencies of hearing, seeing or talking deficits. But only children are more likely to visit their dentists for check-ups and treatment than sibling children--a pattern also found in the Cycle II sample. Thus, it seems that only children are more likely than other children to engage in preventive medicine. This is probably a function of parental concern and the fact that

Table 6.2.4.

Youth Reported Medical Histories of Cycle III by the Criterion Variable (Values are in percents)

	Only	Eldest	Middle	Youngest
1. Percent stayed in hospital overnight or longer	62	56	45	51
2. Percent something wrong with eyes	6	6	6	6
3. Percent with hearing difficulty	3	5	5	4
4. Percent with damaged ears	4	5	5	4
5. Percent with talking problems	4	5	8	7
6. Percent who think that teeth need straightening	24	21	23	21
7. Percent ever prevented from exercise or hard playing	14	16	11	15
8. Percent overweight	27	20	17	13
9. Percent with acne	55	56	45	48
10. Percent seen doctor for check-up in past year	58	62	47	57
11. Percent seen doctor for treatment in past year	58	54	40	50
12. Percent seen dentist for check-up in past year	77	67	55	69
13. Percent seen dentist for treatment in past year	63	59	48	60

parents of only children have more per capita resources for health concerns.

Table 6.2.5. reveals the physician evaluation of youths by the criterion variable. Notice that only children are slightly less likely to be diagnosed as having normal health, but the difference is not marked. Only children are not significantly different from other children in regard to the normalcy of three life-sustaining systems: cardiovascular, neurological and musclo-skeletal systems. Nonetheless, the only child does once again fall into the category of obesity more often than sibling children. Also, the blood pressure readings of the only child are likely to register higher than those taken on other children. These results suggest that in terms of serious conditions, the only child does not differ dramatically from others. They may, however, be more nervous as reflected in the blood pressure readings and nail biting. The obesity problem may signify overindulgence by the parents' toward only children or perhaps a consequence of restriction from hard exercise.

At any rate, the overall message that these data convey are summed in the following statements. First, the general health of American children is very good with low proportions of children having serious ailments. Second, these health profiles are much more similar for children from only, eldest, middle and youngest categories than they are variant. However, a few distinctions appear in the distributions. Parents of young (6-11) only children possibly overprotect and worry needlessly about the physical well-being of their child. Judging from the results taken from Cycle II on youths, it seems that parents of only children outgrow this initial state of concern. Only children are

Table 6.2.5.

Physician Reported Medical Results from Examination of Youths ages 12-17 (Cycle III) by the Criterion Variable (Values are in percents)

	Only	Eldest	Middle	Youngest
1. Percent evaluated as having normal health	73	79	78	78
2. Percent with normal cardiovascular system	81	82	76	78
3. Percent with no neurological conditions	96	91	92	92
4. Percent with normal muscoskeletal system	70	62	70	65
5. Percent with abnormal neurological findings	1	1	1	1
6. Percent obese or very obese	15	11	8	13
7. Percent with 130+ systolic blood pressure	51	41	38	42
8. Percent with 90+ diastolic blood pressure	12	8	8	9

slightly more likely than sibling children to suffer from health problems that are related to nervousness such as nail biting and elevated blood pressure. Upon entering adulthood, this tendency toward high blood pressure may spell trouble for the only child. But these conditions probably have a psychological basis rather than a physical basis.

Because they mature in an all-adult atmosphere or because their parents may expect more from them, only children possibly develop a hard-driving attitude toward success which bolsters blood pressure and may aggravate other psychosomatic conditions. In addition, only children seem more inclined than sibling children to seek preventive medical care, notably dental examinations. The long-range effects of these practices potentially favor the only child in regard to its overall and future health picture. Finally, the only child probably had a rockier entry into life as shown by questions dealing with the child's and youth's infancy. This difference cannot be accounted for as a function of birth order since the eldest children did not exhibit the same patterns. In addition, mothers who have these problems during childbirth may disproportionately be those who decide not to go through the ordeal of childbirth subsequently and thus, have only one child. Such mothers may also have suffered damage to their reproductive tracts that rendered them unable to bear other children. Because the data evaluated for this project do not investigate why parents had only one child, it is very difficult to explain differences among only versus sibling children ex post facto. From Cycle III, it appears relatively certain that only children probably have higher rates of obesity than other children.

This propensity to overweight may be involved with the tendency toward high blood pressure shown by only children. Although there are some noteworthy differences between the health profiles of only and sibling children, the general conclusion drawn from these data is that the health differences are negligible. Where differences prevail, they are not large. Also, the significant differences that exist are parsimoniously explainable as a function of social mechanisms related to family composition rather than real biological differences.

6.3. Socioeconomic Status

Another alternative explanation of the differences in the distributions, where they appear, is that only children are more likely to come from high socioeconomic backgrounds than sibling children. As observed earlier, the relation between social class and health is positive. So the analysis proceeds by taking the distributions that seemed significant at first inspection and examining them under the following conditions of parent education, namely, less than 6 years, 6-12 years, and 12 years or more in school. This has been done to examine whether the originally found significant relations by the criterion variable persist or are altered under these conditions.

For most of the health indicators, the patterns exhibited by the criterion variable are found to persist when disaggregated by parental education. However, some interesting patterns emerge when the original percentages that had suggested a distinction between only and non-only children are reexamined by levels of parental education. These percentages are presented in Tables 6.3.1. and 6.3.2. Note that alterations from the originally found distributions occurred only at the two tails of parent education; namely, either less than six years or more than twelve years of parent education.

Observe Table 6.3.1. In the low socioeconomic group, some original advantages attributed to being an only child disappeared. Specifically, the probabilities of mothers seeking medical care during pregnancy, which in the overall distribution suggested an advantage of being an only child, are the least for the only child in this table. Similarly, the percentages of only children who went to the dentist for check-ups or treatments dropped relative to sibling children. The same is true for percent having had chicken pox.

On all of the other indicators in Table 6.3.1., the alterations that occurred favored the only born. In the original percentages, only children were more likely than sibling children to have something wrong with them as a baby, were more likely to have hay fever, and were less likely to have normal health. Note the percentages of children who had their teeth straightened. Although the original pattern also indicated a higher likelihood for only children to be fitted for braces, the differences between only and sibling children under low socioeconomic conditions are more marked.

Examine Table 6.3.2. Findings from this table indicate a fairly consistent pattern.

Some of the health indicators that originally suggested that an only child is favored medically broke down under high socioeconomic conditions. For example, the percent of children who reported going to the dentist in the past year (Cycle II) did not differentiate by the

Table 6.3.1.

Items in Which Originally Observed Distributions are Altered Under Conditions Where the Highest Parent Education is Less Than Six Years

	Only	Eldest	Middle	Youngest
Cycle II				
1. Percent anything wrong with child	0.0%	5.9%	3.9%	8.1%
2. Percent mothers who sought prenatal care during first trimester	12.5%	32.7%	32.9%	44.7%
Cycle III				
1. Percent had chicken-pox	83.3%	66.7%	70.5%	53.4%
2. Percent had hay fever	0.0%	6.3%	3.9%	6.9%
3. Percent had teeth straightened or braces	16.7%	2.1%	.3%	1.7%
4. Percent treated by dentist in past year	0.0%	27.3%	21.7%	36.2%
5. Percent went to dentist for check-up in past year	0.0%	29.3%	23.0%	38.3%
6. Percent evaluated as having normal health	83.3%	70.8%	68.6%	69.5%

Table 6.3.2.

Items in Which Originally Observed Distributions are Altered Under Conditions Where the Highest Parent Education Exceeds Twelve Years

	Only	Eldest	Middle	Youngest
Cycle II				
1. Percent expressing that child has current health problem that worries parent	14.8%	20.3%	18.3%	15.7%
2. Percent been to dentist in past year	81.5%	85.3%	83.5%	86.8%
3. Percent mothers who sought prenatal care during first trimester	12.5%	32.7%	32.9%	44.7%
Cycle III				
1. Percent been to dentist for treatment	65.6%	66.9%	66.9%	68.0%
2. Percent with 90+ diastolic blood pressure	15.2%	6.7%	5.7%	9.7%

criterion variable under these conditions, whereas in the overall distribution it did. Similar alterations occurred on the prenatal care item (Cycle II) and the probability of going to the dentist for treatment (Cycle III) item.

However, in the original tables, it was observed that parents of only children reported higher frequencies of concern over the health problems of their child than parents of sibling children. This difference faded under high socioeconomic conditions. Also, the percentage differences of only children versus sibling children in terms of 90+ diastolic blood pressure widened under high socioeconomic conditions. Actually, the high socioeconomic condition is the only one in which percentage differences are found on the blood pressure item.

At the lower and upper levels of parent education, many of the originally found differences changed. This suggests caution in the attribution of outcomes to only child status inasmuch as fertility is associated with socioeconomic status. The findings taken from Tables 6.3.1. and 6.3.2. suggest the possibility of an interaction effect. Under low socioeconomic conditions, the only child may fare better in comparison to sibling children in regard to health because it can monopolize the few resources that its family is able to provide. By the same token, at the higher socioeconomic condition, the only child stands equal relative to sibling children health-wise because a family may be able to provide ample resources to assure optimal development for a number of children. Although the data are not entirely consistent in this regard, this possibility is implied.

6.4. Summary

In sum, it seems that the consequences of being an only child in regard to medical well-being have little positive or negative bearing. First, all the criterion categories of children exhibit good health in general. Second, most of the percentage distributions fail to reveal striking differences by the criterion variable. Third, where differences occur they are neither large nor do they consistently disfavor or favor the only child relative to sibling children. Fourth, differences are least likely to appear on the physician evaluation and on major health problems. Finally, the patterns, even if they originally suggested a distinction between only and sibling children, often change when socioeconomic status indicators are brought into the picture.

BIBLIOGRAPHY

National Center for Health Statistics, 1967, "Plan, Operation and Response Results of a Program of Children's Examinations," Vital and Health Statistics, Programs and Collection Procedures Series 1, 5, Washington: U.S. Government Printing Office.

National Center for Health Statistics, 1969, "Plan and Operation of a Health Examinations Survey of U.S. Youths 12-17 Years of Age," Vital and Health Statistics, Programs and Collection Procedures Series 1, 8, Washington: U.S. Government Printing Office.

CHAPTER 7

Cognitive and Intellectual Abilities of Only and Non-Only Children

7.1. Introduction

This chapter is organized around two broad categories--intellectual development, as measured by the Wechsler Intelligence Test, and academic achievement, as measured by the Reading and Arithmetic subtests of the Wide Range Achievement Test 1963 edition (Schaie and Roberts, 1970).

We are aware of the many controversies related to the concept of intelligence and the related issue of its measurement. This report does not attempt to deal with these issues. Instead, we assume that intelligence and achievement are important human characteristics that are distributed with a certain variability within the population. Moreover, we assume that measures of these characteristics are significant indicators of the quality of a population. We also assume that intelligence and achievement are intercorrelated, that is, other factors being equal, achievement depends upon one's genetic ability. Finally, we assume that intelligence and environmental conditions interact, that is, a subpopulation of individuals with equal genotypes of intelligence will develop phenotypically unequal when reared under qualitatively unequal environmental conditions.

For many decades the scientific literature has reported a negative relationship between family size and intelligence test scores. Since there is a relationship between family size and one's birth order then there is presumably a relationship between birth order and the development of intelligence. Therefore, birth order has become a factor of considerable interest and debate in the study of differences in intelligence test scores among siblings. What is not clear is whether the negative correlation between birth order and intelligence is a real or a spurious correlation. The genetic difference among full siblings reflects a random process of genetic endowment. Therefore, if large numbers of siblings differ significantly on intelligence test scores this difference would presumably be the result of differences in family interaction or some other environmental condition or conditions.

If it is true that smaller families have a tendency for their children to develop, on the average, superior cognitive ability over children from large families, then this is important to know. However, this consideration is weighed, by members of the general public, against the widespread belief that children reared in small families, especially only children are psychologically disadvantaged. The general stereotype is that children from small families, especially only children, are less sociable and more withdrawn than children from larger families. Suppose there are intellectual advantages and no significant psychological and social disadvantages for children reared in small families and only-child families, then, from the perspective of family planning as well as child development, these would be important to know. The question of psychological and social differences of only children will be considered in chapter eight.

Before we report the results and analyses of the social effects on intellectual development, we wish to articulate our own theoretical position on intellectual development. However, the position we hold is probably held by most people in the field of cognitive development.

1. We believe that it is important to call attention, in the beginning, to the difference between the fact of individual and group differences on I.Q. test scores and the explanation of these differences.

2. We assume that the phenotypic expression of intelligence is dependent upon one's genotype and environmental conditions, particularly early experience.

3. An intelligence test score is a relative rather than an absolute measure. That is it reflects a person'a ability in relation to a random sample of individuals from a given age category and in comparable environmental conditions.

4. Following from 3., and the research literature also notes, that special environmental conditions (deprived or enriched) may alter I.Q. development, that is, an enriched environment may assure a fuller expression of the child's genotype for intelligence and a very poor environment may retard a child's intellectual development.

5. In respect to group or sub-population intelligence test scores, the relative ranks of the groups would not be expected to change much, if any, owing to the relative stability of the respective environments. Hence, the stability of intelligence is assumed to be as much a result of early experience and stable environments as of the genotype.

The observation that siblings may differ in intelligence, and even identical twins when reared in differing environments, has caused researchers to examine the effects of social influence within the family on intellectual and cognitive development. One such environmental model has been put forward by Zajonc and Markus (1975), who designated it a confluence model. The model suggests that intelligence develops as a function of the "mutual intellectual influences among children as they develop in a family context." It is clear that the assumed operating mechanism is exposure, but the psychological mechanisms involved in exposure are not specified.

In the confluence model the I.Q. of a child is considered to be produced by the average intellectual level to which the child is exposed, including its own.

Fuller and Thompson (1978) provide a lucid description of the confluence model that is worth quoting here. In discussing the assumed effect of exposure in the confluence model they wrote:

> For example, the family of a first child born to a couple of average intelligence (I.Q. = 100) will have an intellectual exposure level of (100 + 100 + 0)/3 = 67. When a second child is born some time later, this level will then be (100 + 100 + 40 + 0)/4 = 60, the number 40 in the numerator being the intellectual level reached by the first child at the time of birth of the second. It can readily be seen that the model generates the predictions that average ability will be lower in large than in small families and that later children will be less able than earlier born. More precise predictions regarding particular children in particular families depend on specification of the preceding variables. Two important ones are intellectual growth rate of children and the pattern of age gaps between births. By recourse to these, Zajonc and Markus explain the upswings we see in the curves for families of size eight and nine, as well as the usually sharp decline between the jth-1 child and the jth child. Thus they argue that with a two-year gap between children, by the time the fifth child is born, the intellectual value of the older child will have increased to such a level that the total intellectual stimulation

> provided in the family commences to increase over that found in a four-child family. In other words, the relation between family size and richness of stimulation becomes quadratic rather than linear. When the age gap is only one year, however, this trend does not appear until eight-child families. This also means that, in general, in larger families, the birth order effect may be canceled out or reversed, with later children being as able as earlier born, and those in the middle the worst.

Fuller & Thompson 1978, p. 461.

Related to the question of mean differences in intellectual development by family size and birth order is the question of whether the differences are constant over time. If they are not constant or parallel over time then they would reflect differential rates of development and presumably differential exposure.

The confluence model is a developmental model that assumes a slow but increasing gap of intellectual differences over time owing to the presumed superior intellectual environment of the older child compared to the younger children, at least, through the fourth born child. More often the question of differing rates of mental development is raised in respect to children reared in very deprived environments compared to children in elaborate and enriched environments. The general proposition is that children in deprived environments have a retarded rate of development compared to children in enriched environments. This proposition has been labeled the cumulative deficit hypothesis. In many respects, the Zajonc and Markus model is a special case of the cumulative deficit argument, that is later born children, especially middle born are disadvantaged relative to first and second born children.

To adequately test the Zajonc and Markus argument one needs to test differences among siblings, that is, look for within family differences in I.Q. scores between older and younger siblings. One of the better studies to date of this sort is Record, McKeown and Edwards (1969), which showed that the differences in mean verbal reasoning between 11 year old siblings are small and the observed association with maternal age and birth order is determined mainly by differences between rather than within families.

The basic idea underlying the cumulative deficit hypothesis is that the relative rate of intellectual growth between children from deprived and enriched environments is different (Jensen 1974) i.e., a differential rate of change in scores over time is assumed.

7.2. Hypotheses

1. It is hypothesized that the simple correlation between birth order and I.Q. development will disappear when parental education, family size, income, presence of father and mother in family and age of mother at birth of child are controlled.

2. Regarding the mean difference in I.Q. scores of blacks and whites it is predicted that racial differences will exist at the upper end of the parental education scale, but disappear at the lower end, i.e., an interaction of I.Q. scores with race and levels of parental education is expected. This hypothesis is derived from the proposition in genetics that the more complex and enriched an environment is the greater is the phenotypic variation in traits among the organisms. Conversely, the more constricted and homogeneous an environment is the less is the phenotypic variation.

3. It follows from hypothesis number 2 that in a matrix of factors that a fewer number of these factors will be related to I.Q. development

of children in a deprived social environment compared to an enriched one. Confirmation of this hypothesis would affirm the assumption that a deprived environment restricts the flow of environmental inputs and consequently magnifies the effect of the reduced number of variables. For example, it was hypothesized that race will not be a significant factor in the deprived environment, but that income will account for more of the explained variance in the deprived environment than in the enriched.

4. It is hypothesized that the relative rates of I.Q. development of blacks and whites in enriched and non-enriched groups do not differ. This will be tested by comparing the I.Q. test scores of different groups of children aged 6-11 with their scores on a second test during ages 12-17.

We will examine the above hypotheses in order beginning with the issue of birth order effects.

7.3. Birth Order and I.Q. Development

(a) Cross-sectional analysis of means

Presented first is a cross-sectional analysis of mean I.Q. scores by birth order and family size with selected levels of parental education held constant. This can provide only a very general picture owing to uncontrolled differences between families. Following this an analysis of mean differences among siblings within a family will be presented. This will provide a more rigorous picture of birth order effects.

The following cross-sectional analysis utilizes 3957 cases of children aged 6-11. To preclude influences that we were unable to control owing to sample size these data are restricted to white children residing in households with both natural parents, where no deaths within the immediate family have occurred, no cases where a sibling is living outside the household, and in which no non-nuclear family members are present. Under these conditions the effects of marital disruption, race, death in the family and the presence of relatives are eliminated. The age order variable under these restrictions is essentially identical to birth order. This relationship of equivalence is implied in Tables 7.3.1. through 7.3.3.

What is remarkable in Table 7.3.1. is the consistency of mean I.Q. from birth order 1 through birth order 5 for children of parents with high education. This can be seen quickly by examining the row means. In this table there appears to be a birth order effect at birth order six, but the sample size is too small (6) for any conclusions to be drawn. Thus it appears that within a given level of parental education that birth order effects, if any, are very very small.

The same general pattern of Table 7.3.1. holds for Tables 7.3.2. and 7.3.3. The family size effect is greater in magnitude than the age order or birth order effect in all three tables. The range of row means (birth order) and column means (family size) within the tables is far less than the differences between the tables. It is interesting to examine the diagonal, that is the first borns of various sized families. It is remarkably similar until the sixth plus born child.

The cross-sectional sample of youth aged 12-17 is presented next using the same classification scheme as in the sample of children aged 6-11. The purpose of analyzing the sample of older subjects is to check the consistency of the patterns. Zajonc (1976) reports data that indicate that the relative scores of only, first and second borns change as a function of age. This can be checked by comparing the patterns of Tables 7.2.1; 7.2.2; & 7.2.3. with those of Tables 7.3.4; 7.3.5., & 7.3.6.

Tables 7.2.1. and 7.3.4. contrast the sample of children with the sample of youth whose parents in each set have 13 or more years of education. The table means of Table 7.2.1. is 111.17 and for Table 7.3.4. it is 111.08. It is clear that the general results are the same. In Table 7.2.1. the only born children have a higher I.Q. than 2nd and 3rd born children though only slightly. However, in Table 7.3.4. the only born youth have an almost 3 point lower mean I.Q. than the higher birth order youth. Statistical tests showed that these differences were not statistically significant. Given that the differences were not statistically significant, and the fact that for educational levels 9-12 and 1-8 the old pattern of only small differences re-emerges, it is likely that the departure in Table 7.3.4. from the general pattern was a sampling result.

(b) Mean differences among siblings

As discussed earlier the comparison of cognitive scores within a family is a more precise way of testing for birth order effects than in cross family comparisons of birth order. The sibling comparison has the advantage of controlling more effectively the genetic and socio-economic differences between families since all comparisons involve differences in scores between or among siblings within a family. This requirement is especially relevant for the confluence model inasmuch as it is based on the intellectual environment within the family. These results are given in Tables 7.3.7. and 7.3.8. Each cell in these tables contains four items of information--the mean of the differences between older and younger siblings for a given birth order comparison, the size of the sample, the standard deviation, and the critical ratio or Z value respectively.

Table 7.3.1.

Mean Wechsler Intelligence Test Scores (Normalized) for White Children Aged 6-11 By Age Order of the Children, Family Size and Parental Education of 13 or More Years

(Sample Size in Parenthesis)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6*	
1	112.92	111.47	111.44	111.07	109.46	107.17	111.34
	(37)	(120)	(108)	(43)	(26)	(6)	(340)
2		112.74	112.48	109.02	107.83	108.00	111.52
		(140)	(118)	(57)	(30)	(9)	(354)
3			113.54	108.19	108.47	108.35	110.91
			(106)	(58)	(32)	(17)	(213)
4				113.86	107.91	108.32	110.70
				(36)	(22)	(22)	(80)
5					110.33	110.18	110.22
					(6)	(17)	(23)
6*						100.50	100.50
						(6)	(6)
Column Means & Tables	112.92	112.15	112.48	110.12	108.52	108.00	111.17
	(37)	(260)	(332)	(194)	(116)	(77)	(1016)

*Includes all families of 6 or more children.

Table 7.3.2.

Mean Wechsler Intelligence Test Scores (Normalized) for White Children 6-11 By Age Order, Family Size and Parental Education of 9-12 Years

(Sample Size in Parentheses)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6	
1	107.44	104.52	104.32	102.13	103.47	94.00	104.17
	(90)	(234)	(224)	(119)	(49)	(13)	(729)
2		104.36	104.94	102.37	101.82	97.74	103.67
		(241)	(248)	(140)	(74)	(27)	(730)
3			105.72	102.84	103.21	101.60	103.82
			(198)	(170)	(73)	(73)	(514)
4				105.06	103.07	101.80	103.40
				(89)	(54)	(82)	(225)
5					102.14	100.95	101.26
					(22)	(62)	(84)
6						100.43	100.43
						(49)	(49)
Column Means & Tables	107.44	107.44	104.96	102.93	102.76	100.67	103.68
	(90)	(475)	(670)	(518)	(272)	(306)	(2331)

Table 7.3.3.

Mean Wechsler Intelligence Test Scores (Normalized) for White Children Aged 6-11 By Birth Order, Family Size and Parental Education of 1-8 Years

(Sample Size in Parentheses)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6	
1	95.07	98.39	94.16	91.46	86.94	83.86	92.72
	(27)	(28)	(19)	(26)	(16)	(14)	(130)
2		93.97	92.00	94.32	91.29	87.04	92.02
		(37)	(40)	(34)	(21)	(27)	(159)
3			93.24	95.31	90.41	87.05	91.29
			(38)	(29)	(34)	(38)	(139)
4				92.62	91.04	84.82	88.78
				(26)	(26)	(40)	(92)
5					93.18	84.81	87.71
					(17)	(32)	(49)
6						87.49	87.49
						(41)	(41)
Column Means & Tables	95.07	95.88	92.91	93.54	90.64	86.07	90.86
	(27)	(65)	(97)	(115)	(114)	(192)	(610)

Table 7.3.4.

Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 13 or More Years.

(Sample Size in Parentheses)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6	
1	109.47	112.45	113.38	112.76	114.65	107.15	112.05
	(95)	(128)	(114)	(54)	(26)	(13)	(430)
2		110.87	111.11	109.18	109.90	107.20	110.31
		(111)	(99)	(50)	(21)	(25)	(306)
3			112.39	107.42	108.00	107.47	109.21
			(28)	(26)	(8)	(19)	(81)
4				119.00	124.00	106.30	112.22
				(7)	(1)	(10)	(18)
5					(0)	107.50	107.50
						(4)	(4)
6						76.00	76.00
						(1)	(1)
Column Means & Tables	109.47	111.72	112.33	110.76	112.09	106.72	111.08
	(95)	(239)	(241)	(137)	(56)	(72)	(840)

Table 7.3.5.

Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 9-12 Years

(Sample Size in Parentheses)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6	
1	106.36	105.49	103.64	104.13	104.55	103.16	104.85
	(221)	(259)	(235)	(139)	(75)	(55)	(984)
2		104.74	102.53	102.84	103.10	102.50	103.28
		(192)	(202)	(138)	(72)	(74)	(678)
3			99.97	101.53	102.56	102.07	101.38
			(61)	(68)	(32)	(54)	(215)
4				104.89	102.38	100.95	102.20
				(18)	(16)	(41)	(75)
5					99.00	105.31	104.47
					(2)	(13)	(15)
6						90.00	90.00
						(4)	(4)
Column Means & Tables	106.36	105.17	102.74	103.19	103.46	102.24	103.80
	(221)	(451)	(498)	(363)	(197)	(241)	(1971)

Table 7.3.6

Mean Wechsler Intelligence Test Scores (Normalized) for White Youth Aged 12-17 By Birth Order, Family Size and Parental Education of 1-8 Years

(Sample Size in Parentheses)

	Family Size (Number of Children)						Row Means and Totals
Age Order	1	2	3	4	5	6	
1	97.94	96.82	94.40	93.91	92.72	84.26	93.86
	(47)	(44)	(42)	(22)	(18)	(34)	(207)
2		93.03	94.08	89.39	88.68	85.19	90.31
		(38)	(39)	(33)	(22)	(36)	(168)
3			94.00	95.48	94.37	90.00	92.95
			(14)	(21)	(19)	(32)	(86)
4				79.50	94.25	87.27	87.71
				(2)	(4)	(22)	(28)
5					(0)	79.43	79.43
						(7)	(7)
6						85.50	85.50
						(2)	(2)
Column Means & Tables	97.94	95.06	94.21	92.05	91.90	86.16	91.92
	(47)	(82)	(95)	(78)	(63)	(133)	(498)

Table 7.3.7.

Wechsler I.Q. Verbal Subtest Score Differences Comparing Older and Younger Siblings Aged 6-11 by Birth

	Younger Sibling					
Birth Order	2	3	4	5	6	7
Older Sibling						
1	0.020	0.138	-1.146			
	(568)	(181)	(52)			
	8.747	8.502	7.815			
Z =	0.055	0.218	-1.057			
2		0.039	0.052	-1.186		
		(383)	(114)	(29)		
		8.222	8.936	2.262		
Z =		0.094	0.062	-1.020		
3			0.021	-0.577	-0.770	
			(280)	(78)	(27)	
			9.280	8.565	9.006	
Z =			0.038	-0.595	-0.444	
4				0.019	-0.162	0.308
				(133)	(41)	(13)
				7.689	6.921	7.337
Z =				0.029	-0.150	0.151

Table 7.3.8.

Wechsler I.Q. Verbal Subtest Comparison of Differences Between Older and Younger Siblings Aged 12-17 By Birth Order

			Younger Sibling		
Birth Order	2	3	4	5	6
Older Sibling					
1	1.698	2.504	4.239		
	(506)	(131)	(46)		
	8.826	7.647	9.838		
Z =	4.325	3.748	2.922		
2		1.077	2.947	3.880	
		(325)	(95)	(25)	
		8.225	7.371	7.562	
Z =		2.360	3.897	2.566	
3			0.377	1.224	0.714
			(191)	(49)	(7)
			7.945	7.307	7.911
Z =			0.656	1.173	0.239
4				1.129	0.000
				(85)	(23)
Z =				6.797	9.605

The results in Table 7.3.7. were the same for birth order comparisons beyond birth order 4 as for four and below but were omitted for reasons of economy of space. The comparisons extended to and included birth order eight.

As Table 7.3.7. clearly shows there are no significant differences among birth orders of siblings on the Wechsler I.Q. verbal subtest for children aged 6-11. The results for the Wechsler Block Design or non-verbal subtest were the same and similarly for the Achievement tests in reading and arithmetic. We conclude that for children aged 6-11 there are no birth order effects among siblings either for intelligence test or achievement test scores.

For youth aged 12-17 the results are somewhat different. First borns score on the Wechsler verbal significantly higher than second, third and fourth borns and second borns score higher than third, fourth and fifth borns, but there the differences stop. On the non-verbal or Block Design subtest there was only one significant difference and it involved a comparison between second borns and fourth borns. There were 95 cases and the Z-value was 2.85.

The Achievement subtest for reading showed results similar to the Wechsler I.Q. verbal subtest though with fewer, only three, significant comparisons. These were the first showing higher scores than the second and third borns and finally the second borns scoring significantly higher than the fourth borns.

The Achievement Test for Arithmetic also had three significant comparisons out of the 24 comparisons. These were the eighth borns scoring higher than the fifth borns, Z = -2.517, but involving only four cases.

Two additional comparisons were significant, namely the sixth born scoring higher than the eighth and ninth borns. These involved 13 and 7 cases respectively. It is likely that these results stem from the erratic nature of small samples.

The analysis results of the birth order differences among the siblings contained in Cycle 2 and Cycle 3 is somewhat perplexing in that Cycle 2 clearly shows no birth order effects, but Cycle 3 shows some pattern of differences. At this point it is not clear whether this result is an artifact of the two samples or whether birth order effects are more likely among older youth than among children aged 6-11. As noted earlier Zajonc has reported data indicating a tendency for scores of only, first and second borns to change positively relative to later borns as a function of increased age. This will be examined again later in this chapter when the birth order effects for both siblings and non-siblings are analyzed in Cycle III giving a much larger sample.

(c) Multivariate analysis of I.Q. development

A stepwise multivariate linear regression analysis with dummy variables was conducted for both Cycle II and Cycle III. Thirty-two independent variables were correlated with the dependent variable Wechsler I.Q. subtests, verbal and non-verbal. The verbal and non-verbal were analyzed separately since they correlate differently with certain of the independent variables. However, an analysis also was made of the combined Wechsler I.Q. test scores.

A list of the independent variables and related correlation coefficients is given in Table 7.3.9. for Cycle II. The Cycle III result is not different and is given in Table 7.3.10. for information.

100

Table 7.3.9.

Multiple Correlation and Other Coefficients for Thirty-Two Variables with the Wechsler Verbal Subtest for Cycle II-Children Aged 6-11

(N = 4974)

Dependent Variable Wechsler Verbal (Normalized Scores)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. Presence or absence of father	.1481	.0219	.0219	.1481
2. Presence or absence of mother	.1523	.0232	.0012	.0656
3. Father present x father's education	.4580	.2098	.1865	.3963
4. Mother present x mother's education	.5011	.2511	.0413	.4201
5. Father x mother x father's education	.5018	.2518	.0006	.3919
6. Father x mother x mother's education	.5050	.2550	.0032	.3419
7. Birth order	.5075	.2575	.0024	-.2153
8. Mother's age at birth of child	.5357	.2870	.0295	.1248
9. Parents' knowledge of child's friends	.5403	.2919	.0049	-.2741
10. Family size	.5577	.3110	.0190	-.3431
11. Race	.5794	.3357	.0247	-.3338
12. Sex of child	.5795	.3359	.0000	-.0162
13. Family income	.5855	.3428	.0070	.4038
14. Race x sex	.5856	.3429	.0000	-.2240
15. Birth order x race	.5873	.3450	.0021	-.2821
16. Amount of time child spends reading books	.5977	.3573	.0123	.1770
17. Eldest born child	.5996	.3596	.0022	.1045
18. Only born child	.5999	.3599	.0003	.0659
19. Middle born child	.6001	.3610	.0001	-.1952
20. Youngest child	.6003	.3603	.0002	.1255
21. Only child x sex	.6003	.3604	.0000	.0361
22. Only child x race	.6004	.3605	.0001	-.0229
23. Only x sex x race	.6006	.3608	.0003	-.0269
24. Eldest x sex	.6007	.3609	.0000	.0529
25. Eldest x race	.6007	.3609	.0000	-.1010
26. Eldest x sex x race	.6007	.3609	.0000	-.0642
27. Middle x sex	.6009	.3610	.0001	-.1155
28. Middle x race	.6009	.3611	.0000	-.2742
29. Middle x sex x race	.6009	.3611	.0000	-.1897
30. Youngest x sex	.6010	.3612	.0001	.0728
31. Youngest x race	.6011	.3613	.0000	-.0667
32. Youngest x sex x race	.6011	.3614	.0000	-.0441

Table 7.3.10.

Multiple Correlation and Other Coefficients for Thirty-Two Variables with the Wechsler Verbal I.Q. Subtest for Cycle III Youth Aged 12-17

(N = 4866)

Dependent Variable Wechsler Verbal (Normalized Scores)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. Presence or absence of father	.1515	.0229	.0229	.1515
2. Presence or absence of mother	.1642	.0269	.0039	.0528
3. Father present x father's education	.4782	.2287	.2017	.4025
4. Mother present x mother's education	.5390	.2906	.0618	.4447
5. Father x mother x father's education	.5392	.2908	.0002	.4001
6. Father x mother x mother's education	.5414	.2931	.0023	.3638
7. Sex of child	.5414	.2931	.0000	-.0065
8. Mother's age at birth of child	.5489	.3013	.0081	.0905
9. Parent's knowledge of child's friends	.5489	.3013	.0000	[illegible] -.~~8053~~
10. Family income	.5620	.3159	.0145	.4190
11. Birth order	.5917	.3501	.0342	-.2981
12. Family size	.5927	.3513	.0011	.3960
13. Race	.6072	.3687	.0174	-.3029
14. Race x sex	.6072	.3687	.0000	-.1917
15. Birth order x race	.6082	.3699	.0012	-.2840
16. Amount of time child spends reading books	.6210	.3857	.0157	.1135
17. Middle born child	.6244	.3899	.0042	-.2285
18. Youngest born child	.6256	.3914	.0015	.0670
19. Eldest born child	.6257	.3915	.0000	.1485
20. Only born child	.6257	.3915	.0000	.0646
21. Only x sex	.6257	.3915	.0000	.0407
22. Only x race	.6259	.3917	.0001	-.0327
23. Only x sex x race	.6259	.3917	.0000	-.0228
24. Eldest x sex	.6259	.3917	.0000	.0892
25. Eldest x race	.6259	.3917	.0000	-.0846
26. Eldest x sex x race	.6259	.3917	.0000	-.0647
27. Middle x sex	.6260	.3919	.0001	-.1412
28. Middle x race	.6260	.3919	.0000	-.2632
29. Middle x sex x race	.6261	.3920	.0001	-.1781
30. Youngest x sex	.6262	.3921	.0000	.0409
31. Youngest x race	.6262	.3921	.0000	-.0792
32. Youngest x sex x race	.6262	.3921	.0000	-.0522

The multivariate analysis results from both Cycle II and III show that, of the total explained variance (36% in Cycle II and 39% in Cycle III), the presence of father and mother and the education level of father and mother account for approximately 70 percent of the variance explained. Neither birth order not being an only or eldest child accounts for any significant portion of the variance.

The same pattern holds for the non-verbal or Wechsler Block Design test. Since there is a time span between the administration of the tests for Cycle II and Cycle III it is interesting to compare the results of the correlation analysis. The comparisons of the multiple R's squared for the cognitive tests are given in Table 7.3.11.

Table 7.3.11.

Multiple Correlations Squared for the Thirty-Two Independent Variables on I.Q. and Achievement Tests

Tests	Cycle II Ages 6-11	Cycle III Ages 12-17
Wechsler:		
Verbal	.361	.392
Non-verbal	.217	.207
Achievement:		
Reading	.291	.327
Arithmetic	.231	.269

The results are essentially the same for both samples. The same set of 32 independent variables was correlated in both Cycles II and III. The field work for Cycle II took place between July 1963 and December 1965 and for Cycle III between March 1966 and March 1970. Though the testing for the two samples occurred over a seven-year period the statistical effects of the variables are remarkably consistent.

It is clear from the foregoing multivariate analysis that hypothesis 1 has been confirmed. That is to say, that the simple correlation between birth order and intelligence disappears when parental education, presence of parents in the family, family size, and income are controlled.

It is interesting to see the effects on the Wechsler I.Q. verbal subtest of varying family structure. This is shown in Table 7.3.12.

The correlation is greatest when both parents are present and least when both are absent. But, between the two parents, the presence of the mother makes the greater contribution. The pattern of relationship is the same for blacks though the correlation is somewhat lower for blacks.

7.4. Multivariate Regression Analysis of Achievement

The reading and arithmetic sub-tests of the Wide Range Achievement Test were used to study achievement performance. Thirteen (13) independent variables were analyzed by a step-wise regression analysis. The results are given in Tables 7.4.1. and 7.4.2. for youth aged 12-17.

Note that in both tests for achievement the youth's intelligence test score accounts for almost all of the explained variance. In the case of the WRAT for Reading it accounts for .4912 and for Arithmetic .4336 out of a total explained variance of .5688 and .4769 respectively. Also, recall that parental education was the single most important

Table 7.3.12.

Multiple R^2 for Wechsler Verbal Subtest for Children Aged 6-11 (Cycle II) Under Varying Conditions of Family Structure*

	R^2
White Males	
1. Father present and mother present	.358
2. Father absent and mother present	.317
3. Father present and mother absent	.291
4. Father absent and mother absent	.206
White Females	
1. Father present and mother present	.352
2. Father absent and mother present	.312
3. Father present and mother absent	.285
4. Father absent and mother absent	.200
Black Males	
1. Father present and mother present	.295
2. Father absent and mother present	.254
3. Father present and mother absent	.227
4. Father absent and mother absent	.143
Black Females	
1. Father present and mother present	.296
2. Father absent and mother present	.255
3. Father present and mother absent	.228
4. Father absent and mother absent	.144

*The list of independent variables analyzed with respect to the above controls may be seen in Table 7.3.10.

Table 7.4.1.

Multiple Correlation and Other Coefficients for Thirteen Variables with the Achievement Subtest for Reading Cycle III

(N = 4866)

Dependent Variable WRAT (Reading)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. Youth's I.Q. (Wechsler)	.7008	.4912	.4912	.7008
2. Youth's Wechsler verbal x parental education	.7287	.5311	.0399	.6546
3. Youth's Wechsler non-verbal x parental education	.7452	.5553	.0242	.5664
4. Race	.7495	.5618	.0065	-.3256
5. Youth's educational aspiration	.7524	.5662	.0043	.3792
6. Family income	.7529	.5669	.0007	.3931
7. The maximum education of parents	.7533	.5675	.0006	.4612
8. Time spent by youth reading books	.7536	.5680	.0004	.0894
9. Mother's age at birth of child	.7538	.5683	.0002	.0817
10. Family size	.7541	.5687	.0004	-.3576
11. Presence or absence of father	.7541	.5687	.0000	.1637
12. Parents' knowledge of friends	.7542	.5688	.0000	-.0828
13. Presence or absence of mother	.7542	.5688	.0000	.0506

Table 7.4.2.

Multiple Correlation and Other Coefficients for Thirteen Variables with the Achievement Subtest for Arithmetic Cycle III

(N = 4866)

Dependent Variable WRAT (Arithmetic)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. Youth's I.Q.	.6585	.4336	.4336	.6585
2. Youth aspiration for education	.6694	.4482	.0145	.3686
3. Race	.6821	.4653	.0171	-.3412
4. Youth's Wechsler verbal score x parental education	.6863	.4710	.0056	.5641
5. Youth's non-verbal Wechsler score x parental education	.6885	.4741	.0030	.5390
6. Parental education	.6893	.4751	.0010	.4025
7. Family income	.6899	.4760	.0008	.3623
8. Presence or absence of father in family	.6903	.4765	.0004	.1663
9. Presence or absence of mother	.6904	.4767	.0001	.0503
10. Family size	.6905	.4768	.0000	-.3241
11. Mother's age at birth of child	.6906	.4769	.0001	.0668
12. Time youth spent reading books	.6906	.4769	.0000	.0503
13. Parent's knowledge of youth's friends	.6906	.4769	.0000	.0642

variable in this study that accounted for a child's I.Q. In the case of the youth sample, for example, parental education accounted for .29 of the explained variance from a total explained variance of .39. It is clear that parental education contributes substantially to a child's I.Q. and the child's I.Q. explains almost half of the child's achievement performance. The data of this study do not permit us to measure the correlation between parental education and the I.Q. of the parents. It is assumed that it is substantial.

The ordering of the variables and the magnitude of the R^2 change in tables 7.4.1. and 7.4.2. give a picture of the relative weight of the variables in accounting for the variance in achievement. The Beta weights and their corresponding F-values do the same for the regression coefficients. These are given in Table 7.4.3. for the Achievement Test for Reading. The results are very similar for the Arithmetic Test.

Given the strong effect between levels of parental education and a child's I.Q. we expected level of parental education to have a greater input in accounting for achievement performance than it did. The assumption was that higher educated parents would have more books and magazines around, would read more themselves and that this would affect positively the children's reading. It does account for some effect, but is seventh in order of effect out of 13 variables.

At this point we feel the desirability of commenting on the controversy over the use of I.Q. tests. A distinction must be made between equal rights under the law and individual differences. The first is a political and legal issue and the latter is a biological and sociological issue. One's intelligence, as well as one's skin color are irrelevant to

Table 7.4.3.

Regression Beta Weights and Corresponding
F-Values for the Reading Achievement Test

(N = 4866)

Independent Variables	Beta	STD Error of Beta	F Statistic
1. Youth's I.Q.	0.62619	0.02326	330.817
2. Wechsler verbal x parental education	0.36420	0.00181	75.381
3. Wechsler block design x parental education	-0.43045	0.00183	110.693
4. Race	-0.08399	0.31312	63.423
5. Youth's aspiration for education	0.06924	0.10831	41.269
6. Family income	0.03023	0.0002	6.190
7. Parental level of education	0.11896	0.16293	5.535
8. Time spent reading books by youth	0.02415	0.00130	6.303
9. Mother's age at birth of child	0.02361	0.01725	5.230
10. Family size	-0.02433	0.04516	3.520
11. Presence of father in family	0.00879	0.27377	0.735
12. Parents knowledge of youth's friends	-0.00719	0.17755	0.559
13. Presence of mother in family	0.00384	0.63253	0.161

one's civil rights. If certain individuals are discriminated against owing to their cognitive abilities then it is important to find out the factors and conditions related to cognitive development as well as mounting legal action to prevent the discriminatory abridgement of individual rights based on irrelevant factors. But the quickest and more efficient way is to remove the obstacles to cognitive development and we cannot do this without understanding the bases for cognitive development, hence the need to study it. Full cognitive development will not eliminate individual differences. It will magnify them; however, it will reduce and probably eliminate aggregate mean differences among races and social categories of people.

The levels of social and technical competence of the members of a population are crucial considerations in societal and individual adaptation. The future of the human species depends upon the quality of the human population and this quality depends not only on genetic input, but also on environmental quality. This appropriately brings us to hypothesis number 2 of this study.

7.5. Effects of Levels of Parental Education on Development of Intelligence

The evolutionary process is enriched by genetic diversity and behavioral diversity is increased by environmental diversity and opportunity. Therefore, environmental diversity and increased individual opportunity for self-development improve a society's adaptative capacities. Thus the socio-cultural context in which human brains and behavior evolve and develop deserve special consideration. This is so because it involves our most precious resource--the human gene pool.

The hypothesis we wish to test now deals with the issue of enriched and deprived environments in respect to intellectual development. It specifically asserts that in a deprived environment the factor of race will disappear, but reappear in the enriched condition. The argument for this is that in a deprived environmental condition the constraints of the environment will tend to reduce the variability of traits within the sub-population. On the other hand, an enriched environment has fewer constraints and behavioral development will achieve greater diversity.

For operational purposes we are defining enriched and deprived environments in terms of levels of parental education. Enriched environment is defined as those children whose parents have 13 or more years of education and a deprived environment is defined as one where the parents have 5 or less years of education. It is, of course, recognized that 13 years of education of black parents may not be equal in quality to the same for white parents. This would be especially true given the time these tests were given, namely the sixties. Therefore, if race reappears at the higher level of parental education an environmental explanation is still possible. It is quite likely, and generally agreed, that race is not a factor in intelligence. What is more significant, and not clear, is the extent that genetic or native ability explains social status achievement irrespective of race. It is obvious that economic and political opportunity are related to achievement, but they can only carry one part of the way. Ability is also essential, but it is quite likely that its successful expression is correlated highly with early childhood motivation and opportunity.

The first analysis (Table 7.5.1) looks at the effects of parental education on the Wechsler Verbal Scores by race. The same variables are involved as in Table 7.3.10. The powerful effect of the education of the parents on the child's I.Q. development as measured by the Wechsler Verbal subtest is evident in the reduction of R^2 produced by the statistical elimination of the education factor. What we wish to test is whether the racial factor discriminates under the condition of equal deprivation between blacks and whites, equal deprivation being defined as parental education level of five or less years.

Table 7.5.1.

Effects of Parental Education on Wechsler Verbal Scores of Children by Race

Education of Father	Education of Mother	Race	R^2
1. Educational factor eliminated	Educational factor eliminated	White	.1057
2. Educational factor eliminated	Educational factor eliminated	Black	.0805
3. Varying	Varying	Black	.2639
4. Varying	Varying	White	.2891

The first and perhaps most striking result is that the racial factor has no effect at the deprived or low level of parental effect for both samples, but is quite significant at the high level of parental education for both samples. This confirms hypothesis number two. This means that, at least, for verbal intelligence there is no difference between blacks and whites under the condition of deprivation as defined by very low levels of parental education. But why does the racial factor reappear at the high level of parental education for blacks and whites? We suggest that this reflects differences in quality of education between the black and white parents. The parents of the black children would have been educated 20 years or more before the 1960's. How much, if any, of a genetic factor may have been involved in selecting both blacks and whites for the low education category we have no way of knowing.

For the Wechsler Block Design or non-verbal subtest for youth aged 12-17 race discriminates at both levels of parental education, though the F-value for the Beta weight at the higher education level is approximately five times larger than the same at the lower education level, namely 50.44 and 10.63 respectively. Why race discriminates on the Wechsler Block Design subtest at the lower level of parental education and not on the Wechsler verbal subtest at the low education category for the youth aged 12-17, we do not know. What is even more puzzling is that for the children aged 6-11 (Cycle 2) the patterns are the same for both the Wechsler Verbal and Block Design subtest that is, the effect of race at the lower level of parental education is zero, but is very significant at the high education category.

Hypothesis number 3 stated that in a deprived environment the number of factors affecting intellectual development would be less than in an enriched environment. This seems logical if one assumes that the greater the diversity in an environment the greater the variety of effects on any one trait. For diverse environmental conditions and resources to have an effect, a child must, of course, experience them. It is assumed here that the higher the level of parental education the greater the opportunity for diverse experience of the children. As implied in the statement of hypothesis two, hypothesis three, is a logical derivation from hypothesis two. The purpose of considering the derivation statement is to permit elaboration of the important concept of environmental diversity and opportunity as necessary conditions for facilitating intellectual development of children and youth and to indicate the important role of education in this process.

An examination of Tables 7.5.2. and 7.5.3. will quickly show the reduction in the number of factors that contribute to a subject's verbal I.Q. Although there is a reduction in the number of significant factors in the low parental education category, the correlation is still as high as for the higher level of parental education (which involved a greater number of factors) and quite a bit greater for the older age category (12-17) and accordingly hypothesis three is confirmed.

It is clear that the mean intelligence of children of parents with higher education is significantly greater than for children of parents with low levels of education (see Tables 7.2.1. and 7.2.3), but what about the rate of development of intelligence of these two subpopulations? We can only address this issue for ages 6-17. This involves hypothesis

Table 7.5.2.

Comparison of Effects of Selected Independent Variables on Children's Wechsler Verbal Score, Aged 6-11 When Parents' Education Was 13 Years or More or 5 Years or Less

	Betas	N = 1499 F-Values For the Betas For Parental Educational Level 13 or More Years	Betas	N = 167 F-Values For the Betas For Parental Educational Level 5 Years or Less
Family size	-0.18133	49.071	-0.29121	11.173
Race	-0.15379	37.513	0.09977	1.690
Income	0.17675	50.008	0.08534	1.231
Mother's age	0.06200	6.240	0.13229	2.519
Only-non-only	-0.02356	0.862	-0.17320	4.671
	$R = .334$; $R^2 = .111$		$R = .3006$; $R^2 = .090$	

Table 7.5.3.

Comparison of Effects of Selected Independent Variables on Youths Wechsler Verbal Score, Aged 12-17 When Parental Education Levels Are 13 Years or More or 5 Years or Less

Variables	Betas	N = 1282 F-Values For Betas For Parental Educational Level 13 or More Years	Betas	N = 192 F-Values For Betas For Parental Educational Level 5 Years or Less
Family size	-0.20206	47.090	-0.17124	5.025
Race	-0.16101	34.276	-0.05349	0.635
Income	0.15399	32.687	0.42298	40.412
Mother's age	0.12188	18.172	-0.06230	0.791
Only-non-only	-0.02663	0.998	0.05619	0.782
	$R = .345$; $R^2 = .119$		$R = .523$; $R^2 = .274$	

number four, which asserts that the rates of intellectual development of children and youth ages 6-17 do not differ. It obviously is true that individuals differ in levels of ability, but do the rates of development differ or do they start at different levels and develop at the same rate? Perhaps some start at the same level and develop at different rates during critical early periods and then stabilize at later ages. Fortunately some of the subjects who were tested in Cycle II were included in Cycle III and tested again. This provided us with a longitudinal sample to check the rates of development of sub-groups within this sample.

The notion that different sub-groups within a population may show different rates of intellectual growth has been approached by the concept of cumulative deficit (Jensen, 1974). This hypothesis assumes that children reared under poor environmental conditions (poor nutrition and poor social and intellectual stimulation) will develop mentally at a slower rate than children in an enriched environment. This hypothesis is examined next.

7.6. The Longitudinal Test of the Cumulative Deficit Hypothesis

The change in each of the normalized cognitive measures is computed by subtracting the adolescent's normalized score for the test in Cycle II from the same in Cycle III. Theoretically, if the tests are all completely valid and perfectly reliable, and if "environmental" conditions are roughly constant or have no effect on cognitive development, then each adolescent's score on the newly defined development difference variable should be approximately zero. In other words, if we are truly measuring one's "intelligence" relative to one's peers (the age-sex normalized scores) at time one and we repeat the measurement at time two, we should observe the same score at both points in time. If not, then intelligence scores of individuals change differentially over time in relation to varying conditions. Systematic departures from zero would indicate, if positive, relative improvement and if negative, relative slowing of growth.

To determine if there are systematic departures by characteristics of the adolescent, we define a series of dummy variables for the comparisons of interest. For example, to contrast only borns with first born children of two or more, we would define a variable D which is assigned the value of 1 for only children and 0 for eldest children. To compare blacks and whites we would assign blacks a value of 1 and whites a value of 0, etc.

To study the dependence of a cognitive change variable (Y) on the interval (X_1) between the administration of the two tests, the adolescent's age (X_2) at the second administration and race (Z), we write the regression equation.

$$Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 Z + B_4 Z X_1 + B_5 Z X_2 \qquad (A)$$

From (A), the regression equation for the blacks may be obtained as

$$Y = B_0 + B_3 + (B_1 + B_4) X_1 + (B_2 + B_5) X_2 \qquad (B)$$

and the same for the whites as

$$Y = B_0 + B_1 X_1 + B_2 X_2 \qquad (C)$$

by putting Z = 1 and 0 respectively in (A).

A list of parallelism of the planes (B) and (C) may be made by formulating the hypothesis

$$B_4 = B_5 = 0$$

according to which (A) is reduced to

$$Y = B_0 + B_3 + B_1 X_1 + B_2 X_2 \qquad (D)$$

An F-test of the significance or otherwise of the difference between the squares of the multiple correlation coefficient is all that is required for the purpose.

If this F turns out to be insignificant one may then proceed to test for the coincidence of the two planes by formulating the hypothesis

$$B_3 = B_4 = B_5 = 0$$

and then comparing the two multiple conditions squared generated by (A) and (C) by means of another F in the usual manner.

It is important to keep in mind that this analysis is concerned only with the rate of change in cognitive variables between subgroups of the population and not in the initial or final differences between them. For example, as will be shown again below, the results on the intelligence test for blacks and whites indicate that the position of blacks relative to whites did not deteriorate over time nor did it improve. There are at least two possible interpretations of this: 1) rates of change in intelligence growth are the same in subpopulations irrespective of differences in their environments or 2) the relative enivronments remained constant over the time period of the two tests, thus producing constant rates of change. The results of the regression analysis for blacks and whites are given in Table 7.6.1. and followed by the same for the criterion groups.

As ΔR^2 indicates, the addition of the dummy variable race contributed little to the reduction of the unexplained variance in change of intelligence test scores of blacks and whites between time one and two. Accordingly, the tentative conclusion is that the rates of change of intelligence in the two subpopulations do not differ. However, the P values for the reading and arithmetic test results show that race does significantly affect growth in achievement. That is, the rates of change in achievement performance for blacks and whites are not the same. The question now is whether this result is due to the interaction of the independent variables or to their independent effects? The second test, ΔR^2 for the interactions is significant and this implies that these results are the outcome of interactions rather than direct independent effects. In other words, the planes which represent the data are not parallel. The Beta values in the full or the saturated model are negative for the dummy variable, indicating a decline in cognitive achievement among blacks relative to whites. As noted in our earlier discussion, this has implications for compensatory school programs since the deficit, small though it is, is in the important curriculum areas of reading and arithmetic.

The results of a similar regression analysis are shown below for the criterion groups.

The general argument employed here is the same for the criterion groups as for the subpopulation of blacks and whites. That is, if, for example, only borns experience an enriched social environment relative to later borns and this differentially affects the rates of cognitive development of the two comparison groups, then the rates of change of the favorable group should be greater than for the later borns. This can be tested by contrasting the rates of change for the only borns with those of the other three groups. The results are also given in Table 7.6.2.

It is clear from the probability values in Table 7.6.2. that none of the differences even approach the .05 level of significance. The tentative conclusion is that the rates of change of cognitive growth over time for only eldest, middle and youngest born children do not differ. A graphic representation of these results is given in Appendix IV. The same conclusion is drawn for blacks and whites for intelligence test scores, but not for achievement test scores. In respect to achievement test scores of blacks and whites the environmental differences between blacks and whites (Table 7.6.1.) show a significant difference. This difference is probably explainable by differences in schools.

This leaves us with a basic question, namely, how are we to account for the original differences and the constant maintenance of these over time between the blacks and whites? Our data will not, of course, allow us to deal with this issue. The only thing we can do is to speculate along with others.

In respect to the argument over the effects of inferior social and intellectual environments on comparative rates of development of intelligence, Jensen concludes that "The existence of the phenomenon supposedly in need of explanation, here called progressive decrement (in rank, percentile, or standardized score), has not been unequivocally established in any samples of the U.S. Negro population" (Jensen 1974,

Table 7.6.1.

Regression Analysis of Change in Intelligence and Achievement Test Scores for Blacks and Whites for the Longitudinal Sample

Variable	ΔR^2 for Coincidence	P	B^3	B^4	B^5	ΔR^2 for Parallelism	P
Wisc. Vocab.	.0012	.485					
Wisc. B.D.	.0003	.868					
I.Q. Develop.	.0005	.810					
WRATR	.005	.014	-.426	.240	.138	.0039	.015
WRATA	.0085	.000	-.300	.155	.060	.008	.000
Achiev. Develop.	.0024	.164					

Table 7.6.2.

Regression Analysis of the Change in Intelligence and Achievement Test Scores Over Time 1 and Time 2 for the Criterion Group Using the Longitudinal Sample

	Saturated vs. Reduced Form	
Only vs. First Borns	ΔR^2	P
Wisc. Verbal	.0037	.643
Wisc. B.D.	.0092	.239
I.Q. Develop.	.0093	.235
WRATR	.0069	.362
WRATA	.0075	.325
Educ. Ach.	.0023	.789
Only vs. Middle		
Wisc. Verbal	.0050	.162
Wisc. B.D.	.0032	.347
I.Q. Develop.	.0046	.200
WRATR	.0006	.884
WRATA	.0029	.395
Educ. Ach.	.0021	.545
Only vs. Youngest		
Wisc. Verbal	.0080	.238
Wisc. B.D.	.0041	.539
I.Q. Develop.	.0095	.263
WRATR	.0053	.423
WRATA	.0079	.243
Educ. Ach.	.0056	.400

p. 1017). The data of this report do not negate this contention.

There is, of course, the strong possibility that the rates of development in enriched and deprived environments are different between birth and age six and become constant before or about age six.

Part of the problem is that the concept of intelligence is not precise. It is viewed by some as innate neurological capacity, by others as information and information processing skills and by still others as some combination of these. Certainly the content or results of learning are involved in intelligence testing, and therefore, the cultural background of the subjects being tested. Our tentative view is 1) that the capacity for human cognitive development is determined by the neurological system and the information or content it contains is determined by exposure to experience. 2) The physiological structure or neurological capacity is determined genetically. 3) The quality and quantity of the information and skills acquired are determined by one's position in the social structure, one's motivation and the complexity of the cultural network within which one functions. What does this imply for the development of differences in intelligence in a population and for the rates of individual development over time?

It allows, of course, for individual differences to begin with and this is clear from studies on intelligence comparing the differences between identical twins and non-twin siblings within a family. The correlation between the scores of identical twins is highest. For individual differences deriving from genetic differences or environmental differences to show up in group or aggregate differences the source of the difference would have to involve, in a systematic way, sizable numbers of a subpopulation. If aggregate rates of change in growth of intelligence for different subgroups experiencing different environmental complexities remain constant over time, then the conditions affecting these groups must be relatively constant. Therefore, the demonstration of constancy of aggregate growth rates should be expected in all, but the most extreme conditions of deprivation.

BIBLIOGRAPHY

Fuller, John L. and William R. Thompson. Foundations of Behavior Genetics. C. V. Mosby Co., Saint Louis, 1978, p. 461.

Harold D. Grotevant, Sandra Scarr, and Richard A. Weinberg, Intellectual Development in Family Constellations with Adopted and Natural Children: A Test of the Zajonc & Markers Model, Child Development, 1977, 48, pp. 1699-1703.

Jensen, Arthur R., "Cumulative Deficit: A Testable Hypothesis?" Developmental Psychology, 1974, Vol. 10, No. 6.

R. S. Record, Thomas McKeown, and J. H. Edwards, The Relation of measured intelligence to birth order and maternal age. Annals of Human Genetics, London, Vol. 33, 1969, pp. 61-69.

Sandra Scarr - Salapatek, Race, Social Class, and I.Q., Science, Dec. 24, 1971, Vol. 174, No. 4016.

Sandra Scarr, From Evolution to Larry P., or What Shall We Do About I.Q. Tests? Intelligence, 2, pp. 325-342 (1978).

Schaie, K. Warner and Jean Roberts, School Achievement of Children 6-11 Years, National Center for Health Statistics, Series 11 Number 103, June 1970.

Zajonc, R. B. "Family Configuration and Intelligence," Science, 1976, 192, 227-236.

Zajonc, R. B. and G. B. Markus. "Birth Order and Intellectual Development." Psychological Review, 1975, 82, pp. 74-88.

CHAPTER 8

Psychological and Social Characteristics of Only Children Compared to Sibling Children

8.1. Introduction

As shown in chapter seven the alleged advantage for I.Q. development of an only chld or a first or second born child was shown to be unrelated to birth order per se when other variables were controlled. This same deficiency of inadequate controls plagues research on the psychological and social affects of being an only child. Groat, Wicks and Neal (1980) recently have shown the following shortcomings of research designs purporting to show the behavioral affects of being reared an only child.

> 1) data analysis based on extremely small samples selected more on the basis of convenience than randomness; 2) few if any experimental or statistical controls for possible intervening variables between sibling status and the dependent variables; 3) the predominant use of children, adolescent and young adults as subjects; and 4) an emphasis on measuring the psychological rather than the behavioral constellations of the "only child syndrome." (p. 31)

The above listed shortcomings are fairly obvious except for number three or the "predominant use of children and adolescents." The difficulty here is the assumption of behavioral continuity, that whatever is found during childhood or adolescence will persist into adulthood or have significance for adulthood. This we know is pretty much true for intelligence, but is less true for social behavior patterns owing to learning and re-learning as environmental situations change. What we need to know is whether there are specific psychological traits associated with only-children status that are less associated with sibling status, and if so, do these traits affect social interaction and social adjustment.

8.2. The Data and Variables

In an attempt to remedy some of the deficiencies cited above, and at the same time to test for continuity of effects associated with only versus sibling childhood status data were selected from the school and family questionnaires in Cycles II and III. The youth data in Cycle III involved an additional data source using the same items and were filled out by the youth themselves. The items for both cycles are indicators of sociability, social and psychological adjustment and achievement motivation.

Several researchers have looked into the social and psychological characteristics and their differentials by family size, birth order, etc. Waldrop and Bell (1964) found in a sample of nursery school boys a correlation ($r = .51$) between family size and the degree to which the boys sought contact with teachers. The larger the families the more sociable were the children. It is not clear whether this finding indicates that children from larger families are more sociable or that children from smaller families are more socially independent or that children from large families are starved for interaction with adults.

A study by Claudy (1979) that is more directly related to this study, focused on only and non-only children. They covaried out the effects of SES rather than looking at differences by various SES levels. They fouund that non-onlies were more likely to date than onlies, an indication of sociability. Further evidence for this was their finding that non-onlies scored higher than onlies on what they called a sociability scale. In general, the literature suggests that only children are less sociable than non-onlies and tend to be oriented toward solitary type activities.

8.3. Variables, Sample Size and Purpose of Analysis

In both samples (Cycle II and Cycle III) 19 variables were correlated with 8 dependent variables in Cycle II and 7 in Cycle III. The sample size for Cycle II was 4,973 and for Cycle III it was 4,868. The independent variables are listed below.

1. Educational achievement as measured by the combined WRAT reading and arithmetic tests
2. Family income
3. Birth order as shown by birth certificate
4. Family size
5. Race
6. Sex
7. Presence or absence of father in family
8. Presence or absence of mother in family
9. Mother's age at birth of child
10. Age of child in months
11. Parents knowledge of child's friends
12. Presence of father x father's education
13. Presence of mother x mother's education
14. Child or youth's I.Q.
15. Height/weight index
16. Only child

17. Eldest child

18. Middle born child

19. Youngest child

The dependent variables for Cycle II are (sample of children).

1. Amount of time child spends reading books
2. Amount of time child spends watching T.V.
3. Amount of time child spends by self
4. Amount of time child spends working (chores)
5. Amount of time spent with friends
6. How well child gets along with friends
7. Degree of shyness
8. Achievement performance

The dependent variables for Cycle III are (youth sample).

1. Amount of time spent reading books
2. Amount of time spent watching T.V.
3. Amount of time spent listening to the radio
4. Number of contacts with police
5. Youth's educational aspiration
6. Degree of shyness
7. Achievement performance

A stepwise multivariate linear regression analysis with dummy variables was carried out on the above for both Cycle II and Cycle III. As can be seen the list of dependent variables for Cycles II and III are not identical. Cycle II had some variables that were not present in Cycle III and Cycle III had some that were not present in Cycle II. The results of the analyses for Cycles II and III are given in Table 8.3.1. and Table 8.3.2.

When several dependent varialbes are involved in a model some intercorrelation among the dependent variables is inevitable. For example, "shyness" and "getting along with friends" was negatively correlated (-.1921) as one would expect. Overall the correlation matrix showed that the correlation among the dependent variables was small to negligible. Accordingly, no methodological problem is involved here owing to the sizable number of dependent variables employed in the study.

The analysis was designed to achieve several purposes or objectives. First, given the argument about the supposed advantages for intellectual development of only children it is important to see if this translates into an advantage for social adaptation and social competence. Therefore, we intend to test the effect of intelligence on sociability and social adjustment. Second, we wanted to test the effects of family income, education of parents and family size on sociability of only as compared to sibling children.

At this point it is well to remind the reader of the discussion in chapter 2 on the pre-processing phase of the analysis. That is, a very large number of items were Lancaster scored to determine whether an item discriminated between only and sibling children. If it did not it was excluded from subsequent analysis. It is well to mention some of the items that were excluded for this reason. Some of the excluded items are of the sort normally associated with the stereotype of only children as non-sociable, difficult to get along with and selfish. For example, in Cycle II frequency of being chosen leader of the group, frequency of required disciplinary action and teacher's adjustment evaluation were excluded for lack of discrimination between only and sibling children. In Cycle III, self-control happiness, dependability, importance of being ambitious, and frequency of dating were excluded.

8.4. The Data Analysis

It has been argued from Galton to present times that only-borns and the first-borns among siblings have an advantageous social position owing to their birth order. This advantage supposedly produces intellectual and personality traits conducive to success in adult life. Such an argument assumes that only-borns and first-borns develop the traits in question to a significantly greater degree than sibling children.

An alternative argument could be developed along the lines that there are not significant personality trait differences associated with birth order, but instead parents invest in earlier-born or only-born children to a greater extent than later siblings. Such an investment would provide early economic pay-offs to the parental members and thus, in the case of first-borns, ease their burdens for rearing later children. This alternative argument is based on a premise of greater economic and social opportunities for the first-born rather than on personality differences arising out of assumed birth order effects.

We will analyze both samples by focusing on their academic achievement and sociability.

Academic Achievement of only and Sibling Children Aged 6-17

The reading and arithmetic achievement tests, using normalized scores, are the dependent variables for the analysis of academic achievements. Fifteen independent variables were chosen systematically for analysis using a stepwise multivariate linear regression with dummy variables.

The selection of the variables in order of their explanatory importance out of a list of n-independent variables in a multiple regression model was done by the step-wise regression analysis. Accordingly, the entry into the multiple regression equation of the first independent variable was determined by the variable within the total set of independent variables that had the largest single correlation coefficient and F-value. For example, if there are 15 independent variables, then the one with the largest simple correlation within the set would be entered first. The computer would then choose the second entry variable that had the largest partial correlation among the remaining 14 variables. The third entered variable would be the one with the highest partial correlation among the remaining 13 and so on. If a variable fell below the preselected F-value for inclusion then it would be excluded.

It is clear from Table 8.3.1. that the child's intelligence test score, time spent reading books and father's level of education are the principal variables in this study that account for reading achievement. Birth order position is unrelated to reading achievement.

We shall now contrast the sample of youth aged 12-17 on the reading achievement test. There are three variables in this analysis that were not in Table 8.3.1. These are youth's educational aspiration and a constructed variable, namely youth's verbal score x parental level of identification and the same for the youth's block design score. These results are given in Table 8.3.2.

Table 8.3.1.

Summary Correlation Analysis for the Reading Achievement Test: N = 4,973 Children Aged 6-11

Dependent Variable: Reading Achievement Test (Normalized Scores)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. I.Q. development of child	.6203	.3848	.3848	.6203
2. Time spent reading books	.6348	.4030	.0181	.2351
3. Presence of father x father's education	.6470	.4186	.0156	.3800
4. Family size	.6505	.4232	.0045	-.2856
5. Family income	.6525	.4258	.0026	.3608
6. Race	.6539	.4276	.0017	-.2951
7. Presence of mother x mother's education	.6546	.4286	.0010	.3611
8. Middle born children	.6554	.4295	.0009	-.1624
9. Mother's age at birth of child	.6560	.4303	.0007	.0895
10. Eldest born children	.6565	.4310	.0007	.1102
11. Presence or absence of father	.6569	.4315	.0004	.1776
12. Presence or absence of mother	.6570	.4317	.0001	.0658
13. Parents' knowledge of children's friends	.6570	.4317	.0000	-.2302
14. Only borns	.6570	.4317	.0000	.0415
15. Youngest borns	.6570	.4317	.0000	.0932

Table 8.3.2.

Summary Correlation Analysis for the Reading Achievement Test for Youth, aged 12-17: N = 4868

Dependent Variable: Reading Achievement Test (Normalized Scores)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. I.Q. development of child	.7008	.4912	.4912	.7008
2. Youth's I.Q. verbal score x parental education level	.7287	.5311	.0399	.6546
3. Youth's I.Q. block design score x parental education	.7452	.5553	.0242	.5664
4. Race	.7495	.5618	.0065	-.3256
5. Youth's educational aspiration	.7524	.5662	.0043	.3792
6. Family income	.7529	.5669	.0007	.3931
7. Parental education	.7533	.5675	.0006	.4212
8. Book time	.7536	.5680	.0004	.0894
9. Mother's age at time of birth of youth	.7538	.5683	.0002	.0817
10. Family size	.7541	.5687	.0004	-.3576
11. Only borns	.7541	.5688	.0000	.0382
12. Parents' knowledge of youth's friends	.7542	.5688	.0000	-.0828
13. Presence or absence of father	.7542	.5689	.000	-.1787

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
14. Middle-borns	.7542	.5689	.0000	-.1787
15. Youngest-borns	.7543	.5689	.0000	.0608
16. Presence or absence of mother	.7543	.5689	.0000	.0506
17. Eldest-borns	.7543	.5689	.0000	.1175

A comparison of Tables 8.3.1 and 8.3.2. show the explained variances for youth is 13 percent higher than for the children. The youth's intelligence score is the single most powerful explanatory variable as was the case for the children. Although the I.Q. variable accounted for 38 percent of the explained variance for the children, it accounted for 49 percent for the youth. The only other variables of significant consequence were the interaction variable of the Verbal and Block Design subtests with parental education. Parental education was defined as the number of years of schooling completed by the parent with the highest educational attainment. These two variables accounted for almost all of the remaining seven percent of the variance explained. Again birth position did not contribute anything to explaining achievement.

Jensen (1980) contends that the Wechsler Vocabulary test is the single most important predictive subtest of the Wechsler set for general intelligence and that the block design test follows close behind. Many researchers (Nisbet and Entwistle, 1967 and Jensen, 1968) have argued that verbal abilities are more sensitive to environmental differences than other abilities. If this is true it should be reflected in differences in factors associated in the reading and arithmetic achievement test results. With this in mind we turn now to a comparison of the reading achievement subtest results with the arithmetic subtest for both Cycle II and III data.

Table 8.3.3.

Summary Correlation Analysis for the Arithmetic Achievement Test: N = 4973, Children Aged 6-11

Dependent Variable: Arithmetic Achievement Test (Normalized Scores)

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
1. I.Q. Development	.6033	.3640	.3640	.6033
2. Father's presence x father's education	.6117	.3741	.0101	.3479
3. Time spent reading books	.6167	.3804	.0062	.1795
4. Family income	.6182	.3822	.0018	.3301
5. Race	.6191	.3833	.0010	-.2738
6. Mothers presence x mother's education	.6200	.3844	.0011	.3349
7. Youngest born	.6204	.3849	.0005	.0965
8. Eldest born	.6208	.3853	.0004	.0782
9. Parents' knowledge of child's friends	.6210	.3856	.0002	-.2211
10. Presence or absence of father	.6211	.3858	.0002	.0871
11. Mother's age at birth of child	.6213	.3858	.0002	.1631

Independent Variables	Multiple R	R^2	R^2 Change	Simple R
12. Family size	.6215	.3863	.0002	-.2430
13. Middle born children	.6218	.3866	.0003	-.1236
14. Only born children	.6219	.3867	.0001	.0178

*The F-level for presence or absence of mother was insufficient and the computer program excluded this factor for Table 8.3.3.

The first noticable fact is that the explained variance for the arithmetic subtest is approximately five percent less than for the reading test for Cycle II. This conforms to the hypothesis that the reading test is more sensitive to environmental factors than the arithmetic test. The child's I.Q., father's education, and book reading habits of the children still explain almost all of the variance. Though family size fell into fifth place in order of explanatory power for the reading test, it was twelfth on the arithmetic test, and the presence or absence of the mother in the family was excluded by the computer program for being below the required F-level for inclusion. The remaining question is: do these differences hold for the teenagers? Table 8.3.4. below will answer this question.

Table 8.3.4.

Summary Correlation Analysis for the Arithmetic Achievement Test: N = 4868, Youth Aged 12-17

Dependent Variable: Arithmetic Achievement Test (Normalized Scores)

Independent Variable	Multiple R	R^2	R^2 Change	Simple R
1. I.Q. Development	.6585	.4336	.4336	.6585
2. Youth's education aspiration	.6694	.4482	.0145	.3686
3. Race	.6821	.4653	.0171	.3412
4. Youth's verbal I.Q. x parental education	.6863	.4710	.0056	.5641
5. Youth non-verbal I.Q. x parents' education	.6885	.4741	.0030	.5390
6. Level of parental education	.6893	.4751	.0010	.4025
7. Family income	.6899	.4760	.0008	.3623
8. Only borns	.6904	.4766	.0006	.0131
9. Presence or absence of father in family	.6907	.4771	.0004	.1663
10. Presence or absence mother in family	.6908	.4772	.0001	.0503
11. Family size	.6909	.4774	.0001	-.3241
12. Mother's age at birth of child	.6910	.4776	.0001	.0668
13. Eldest borns	.6911	.4776	.0000	.0926
14. Middle borns	.6911	.4776	.0000	.1463

Independent Variable	Multiple R	R^2	R^2 Change	Sample R
15. Time spent reading books by youth	.6911	.4776	.0000	.0503
16. Parents' knowledge of youth's friends	.6911	.4777		
17. Youngest borns - excluded owing to insufficient F-level				

It is clear that the arithmetic achievement test for the youth, as well as for the children, reflects less sensitivity to environmental factors compared to the reading achievement test. This has been a frequent finding and probably should be expected. The total variance explained for the youth on the arithmetic test was .47 and on the reading test .56. A child can and does learn its language through normal social interaction and without the necessity of being formally taught. Consequently, there are many social reinforcements for learning language and these acquired skills in turn reinforce the learning to read. The exposure to arithmetic, on the other hand, is almost exclusively the domain of formal instruction. Accordingly, the rate and scope of social reinforcements are reduced compared to reading stimuli.

A comparison of Tables 8.3.3. and 8.4.4. is interesting. For example, I.Q. development of youth explains seven percent more of the variance in arithmetic achievement than it does for children, namely .43 compared to .36. The negative influence of race has increased from nonchildren to statistical significance for the youth sample.

Social and Psychological Consequences of Being Reared An Only Child

As shown in the introduction to this chapter a frequent finding reported by other researchers has been that only children have been somewhat less sociable than non-onlies and have shown a greater tendency to engage in solitary activities. It was also pointed out that, in general, these studies had not been well controlled (see reference cited in the introduction to this chapter).

Previously, we have examined the behavior of the differentials in the intellectual and achievement variables under appropriate controls. Let us now offer similar treatment to some of the variables in the social and psychological dimensions.

Shyness is a dependent variable contained in both cycles so we will begin by analyzing the results on this dependent variable. The 19 independent variables listed in section three of this chapter were correlated with degree of shyness in both cycles. The shyness responses for both samples were normalized for purposes of the correlation analysis.

The multiple correlation squared for Cycle II was .0186 and for Cycle III it was .0340. Neither family size or birth order were even slightly related to shyness. There were no significant differences by I.Q. development, by achievement performance or by sex. It is obvious that whatever determines shyness it is not related to birth order or family size. It is probably related to early childhood experiences especially in areas of interpersonal relations with others and especially parents. Also, in this study presence or absence of the father or mother in the family did not produce a detectable effect on shyness.

Two activity variables common to both samples are time spent reading books and time spent watching television. These are solitary activity variables and should enable us to see if only children differ in this respect from sibling children.

The results on these two solitary activities are interesting. First, the correlation is significantly greater among the youth than among the children. The multiple correlation for children was .1515 (R^2 = .0229) and for the youth the corresponding value was .4190 (R^2 = .1018). The detailed results are given in Tables 8.3.5. and 8.3.6. below.

It is clear from the results in Table 8.3.5. that none of the 19 factors correlate with the time spent by the children watching television. For the youth, however, certain factors turned out to be significant as may be seen in Table 8.3.6.

Only ten percent of the variance in television watching among the youth is accounted for, and of this ten percent, four percent is explained by the youth's I.Q. score. The relationship is negative, that is, the higher the I.Q. score the less the time spent watching television. Three other factors accounted for slightly over one percent each of the variance. They were race, age of the youth and father's level of education. Age of the youth and father's level of education are negatively correlated and race is positively correlated.

The next solitary activity variable which was present in both samples was time spent reading books.

The results for the children and youth samples for "time spent reading books' were almost opposite to the finding on television. For example, the variables correlated higher for the children's sample than

Table 8.3.5.

Multiple Correlation and Related Coefficients with the Dependent Variable - Time Spent Watching Television N = 4973, Children Aged 6-11

Dependent Variable: Time Spent Watching Television (Normalized Scores)

Independent Variable	Multiple R	R^2	R^2 Change	Simple R
1. Presence of father x father's education	.0757	.0057	.0057	-.0757
2. Age of child	.0918	.0084	.0027	.0543
3. Mother's age at birth of child	.1057	.0111	.0027	-.0569
4. Height/weight index	.1157	.0138	.0026	.0410
5. Presence or absence of father	.1256	.0158	.0019	-.0307
6. Youngest born	.1328	.0176	.0018	.0098
7. Educational achievement (combined reading & arithmetic)	.1377	.0189	.0013	.0661
8. Sex of child	.1395	.0194	.0005	-.0183
9. Presence of mother x mother's education	.1414	.0200	.0005	-.0719
10. I.Q. development	.1435	.0206	.0006	-.0411
11. Race	.1449	.0210	.0003	.0421
12. Eldest born	.1460	.0213	.0003	-.0102
13. Family size	.1474	.0217	.0004	-.0066
14. Birth order as shown by birth certificate of child	.1491	.0222	.0005	-.0025

Independent Variable	Multiple R	R^2	R^2 Change	Simple R
15. Parents' knowledge of child's friends	.1499	.0224	.0002	.0537
16. Presence or absence of mother	.1506	.0226	.0002	-.0132
17. Family income	.1509	.0227	.0001	.0467
18. Middle born	.1512	.0228	.0000	-.0109
19. Only born	.1515	.0229	.0001	.0016

Table 8.3.6.

Multiple Correlation and Related Coefficients With the Dependent Variable - Time Spent Watching Television

N = 4868, Youth Aged 12-17

Dependent Variable: Time Spent Watching Television (Normalized Scores)

Independent [illegible]le	Multiple R	R^2	R^2 Change	Simple R
1. I.Q. development	.2003	.0401	.0401	-.2003
2. Race	.2390	.0571	.0169	.1921
3. Age of youth	.2705	.0732	.0160	-.1331
4. Presence of father x father's education	.2889	.0834	.0102	-.1903
5. Height/weight index	.2995	.0897	.0062	-.0810
6. Presence of mother x mother's education	.3064	.0939	.0041	-.1646
7. Family income	.3095	.0958	.0019	-.1914
8. Youngest born	.3110	.0967	.0009	.0134
9. Mother's age at birth of child	.3126	.0977	.0010	-.0341
10. Middle born	.3142	.0987	.0009	.0570
11. Presence or absence of father	.3156	.0996	.0008	-.0986
12. Educational achievement	.3165	.1002	.0006	-.1522
13. Sex of youth	.3173	.1007	.0005	-.0152
14. Presence or absence of mother	.3178	.1010	.0002	-.0215

Independent Variable	Multiple R	R^2	R^2 Change	Simple R
15. Only born	.3178	.1010	.0002	-.0049
16. Eldest born	.3186	.1015	.0002	-.0489
17. Parents' knowledge of youth's friends	.3188	.1016	.0001	.0432
18. Size of family	.3190	.1017	.0001	.1340
19. Birth order as shown on birth certificate	.3190	.1018	.0000	.0862

for the youth sample. The same independent variables used in Tables 8.3.5. and 8.3.6. were also used in the analysis of "time spent reading books." The multiple R for "time spent reading books" for the children's sample was .3453 ($R^2 = .1192$) and for the youth sample the same was .2300 ($R^2 = .0529$).

In the youth sample sex is the only significant factor, with females reading more than males. In the sample of children, educational achievement accounts for five percent of the explained variance or almost one half of the variance accounted for, and sex accounts for two percent--again the females reading more than the males. We must conclude that insofar as reading books and watching television are solitary or passive types of activities that birth order is not related to either. That is the amounts of time spent on these activities by only children do not differ from sibling children.

The remaining dependent variables are not common to the children and the youth samples and will therefore be analyzed without regard to cross-sample comparisons. The children's sample will be looked at first and with respect to four dependent variables. These are: time spent with self; time spent working; time spent with friends and how well the child gets along with other children. The multiple correlation coefficient for each of these dependent variables is small and the complete correlation tables will not be given. Instead, we will simply report the overall results and discuss the specific factors that were significant. The independent variables analyzed are again the same as those in Tables 8.3.1. through 8.3.6.

The information on the social and psychological adjustment of the children in Cycle II, is provided by the parents and teacher's questionnaires.

Only a very few of the 19 variables were correlated with either of the four dependent variables. Furthermore, these correlations were very low.

The youngest born children spent more time by themselves though the correlation was very small and accounted for only one percent of the variance. There was also a slight tendency for children with higher I.Q. to spend more time by themselves.

Only two factors correlated with amount of time the child spent with friends and both were negative. These were "parents knowledge of child's friends" and race. The more parents were aware of the child's friends the less time the child spent with friends. Also, blacks spent less time with friends than white children. This latter relationship accounted for only one percent of the variance and the "parents' knowledge of child's friends" only two percent.

It is difficult to interpret why black children spend less time with their friends than white children. The number of siblings for black families is greater and therefore black children may spend more time with their siblings.

If one assumes that parents knowledge of their children's friends is an index of the parents' supervisory activities over their children then this will explain why the knowledge of parents about their child's friends was inversely related with the time the child spends with the friends; that is, more time is spent with the parents' and therefore, there remains less time for friends.

The dependent variable on how well the child gets along with other children was an almost total failure. Only one variable explained as much as one percent of the variance and the total variance explained was only two percent. Educational achievement was negatively correlated with degree of getting along with other children. The reason for this is not clear unless these children spend more time with their studies.

The final dependent variable for the social variables for the Cycle II sample was--time spent on work or chores. Only one variable made a significant contribution and this was "age of the child," the older the child the greater the time spent on chores. This is an obvious finding. What was surprising was that being an only child, a child from large families, and family income did not make any difference.

There were three dependent variables included in Cycle III (youth sample) that were not included in Cycle II. These were: 1) time spent listening to radio; 2) youth's aspiration; 3) contact with police.

Analyzing "time spent listening to radio" we find a multiple R of .32 for 16 independent variables. Age and sex of the youth alone yielded a multiple R of .3079. The total variance explained by the 16 variables was .1050 and age and sex explained .0948 which is over 90 percent of the explained variance. The sex variable was treated as a dummy variable X_0 & X_1. X_0 was males and X_1 females. The simple correlation for age and radio time was .2409 and for sex .1916. The Beta value for the dummy variable sex was .1907. No other variable contributed more than .0046 change in R-square and this was I.Q. This neglible effect was negative. Birth order and family size showed no relationship to total radio listening time.

The analysis of youth's aspiration revealed several interesting results. Listing the independent variables in order of the variance explained four variables contributed one percent or more to the explained variance. These were I.Q. development .1531; mother's education .0243; family income .0115 and race .0121. These four add up to .2010 or 85 percent of the total variance (.2375) explained. The simple R for I.Q. development was .3913, for mother's education .3877, for family income, .3019 and for race -.0531. The simple correlation coefficient for race and aspiration is negative, indicating that blacks have lower educational aspiration than whites. However, when family income and father's education are controlled this become positive. For example, the Beta value for race is .1289 which shows a slightly higher educational aspiration for blacks than for whites.

Though sex of the youth accounts for only .0050 of the explained variance or a negligible amount, the Beta value of this dummy variable is significant with a Beta value of -.0702 and an F-value of 31.21 with degrees of freedom of 19 and 4849. Though the Beta value is small its negative direction shows females to have a slightly higher educational aspiration than males. This result is also of methodological interest in respect to the use of dummy variable analysis; namely, when using dummy variables the Beta coefficients are more appropriate than the predictive coefficients for interpreting the analytical results.

We turn now to the last dependent variable analyzed for the youth sample. This is the variable on "official contact by the youth with the police." The variable was categorized three ways: 1) contact with police and punished; 2) contact with police, but not punished; 3) never contacted by police. These scores were normalized.

There were no relationships of birth order or family size to frequency of contact with police among the youth. However, the traditional finding that male youth have a significantly higher rate of contact than females did show up. Also, as one would expect, the older the youth the greater the police contact. Finally, the presence of the father and the mother in the famly had a small effect in the direction of lower police contact rates. The R^2 change on the presence or absence of father or mother was not significant, but the Beta values for these dummy variables showed significant F-values.

The total multiple correlation for the 18 variables with contact with police was $R = .3267$ ($R^2 = .1067$). The variable that explained most of the variance was sex which accounted for .0625 out of the total of .1067. The second variable by order of contribution to the explained variance was age of the youth which explained .0325 of the variance. These were followed by presence of father and then presence of mother. The R^2 change contributions here were .0041 and .0016 respectively. The corresponding Beta values were .07 and .05. The total sample analyzed consisted of 4868 cases.

It is of interest to observe here that the variables of race and income as well as the variables of birth order and family size which were mentioned earlier did not correlate with frequency of police contact when the other variables were controlled. For example, the partial correlation coefficient for income and police contact was .0043 and for race it was .0190.

It seems clear that these variables (birth order, family size, family income, level of parental education, race and youth's I.Q. and presence or absence of father and mother) individually and collectively account for very little of the variance in frequency of law violation among youth. This suggests the need to look elsewhere for variables to account for the variance in this variable. We would suggest the formulation of variables dealing with interpersonal relations between parents and between parents and children and especially the attitudes and respect for the law. Information of this sort was not available to us for this study.

8.5. Summary

No relationships between birth order, family size and selected dependent psychological and social variables were found when related variables were appropriately controlled.

The explained variance was associated with the control variables as the summary below indicates.

I.Q. development of the children aged 6-11 accounted for by far the most of the explained variance of reading achievement, namely 38 percent from a total of 43 percent. The child's study habits such as time spent reading books and parental education were the other significant factors, accounting for a little over three percent of the variance. Among the youth, 56 percent of the variance in academic achievement was explained. I.Q. development of the child accounted for 49 percent and parents education for almost all of the remainder or about 7 percent. This corresponds quite closely to the Sewell and Houser (1976) results.

The factors that correlate with reading achievement are more sensitive to reading achievement than to achievement in arithmetic. The same set of independent variables applied to the youth sample for achievement in reading explained .5689 of the variance in reading and .4777 in arithmetic. For the children, the respective results are reading .4317 and arithmetic .3867.

The traditional explanation that has been given for this is that development of verbal skills is more dependent upon the social environment than are skills in arithmetic. In a sense this is true, but it is also a truism. That is children are exposed to speech and language from birth and learn it as a necessary correlate to interaction. On the other hand, they are never exposed to formal notions of arithmetic until and unless they go to school. Accordingly, this differential rate and condition of exposure to reading and arithmetic would be expected to make a significant difference in the learning of these materials.

Turning now to the social and psychological factors, we find that only and sibling children do not differ in respect to shyness for both Cycles II and III. Such solitary activities as watching television, listening to the radio and reading books also did not differentiate between only and sibling children.

In respect to watching television among youth aged 12-17, I.Q. development and time spent watching television were negatively correlated. Race and television watching time were positively correlated with blacks spending more time than whites.

Tne next solitary variable was "time spent reading" books. Neither this variable nor the one on "time spent watching television" were correlated witn birth order or family size. Females spent more time reading than males.

The analysis of youths' aspirations revealed several interesting findings. Four variables make up the principal explanatory factors.

These were: I.Q. development; mother's education; family income and race. Together these accounted for almost 24 percent of the variance explained for aspiration. The relationship between blacks and educational aspiration was negative. Given the powerful influence of the level of education of mother, it is suggested that the difference between the level of parental education of blacks and whites is the principal factor accounting for the differential level of educational aspiration between black and white youth and the data of this study indicate this.

The final dependent variable considered was "youth's contact with police." Again, there were no birth order or family size effects. Males were shown to have a higher rate of contact with police than females. The presence of father and mother in the house (non-broken home) was negatively correlated with police contact.

BIBLIOGRAPHY

H. Theodore Groat, Jerry W. Wicks and Arthur G. Neal. Differential Consequences of Having Been an Only Versus a Sibling Child, final report - Contract NIH - NO1 - HD - 92806, Center for Population Research, National Institute of Health, May 12, 1980, ch. 3, p. 31.

John S. Claudy, William S. Farrell, Jr., and Charles W. Dayton. Final report - Contract No. NO1 - HD-28254, Dec. 1979, American Institute for Research, P.O. Box 1113, Palo Alto, Calif. 94302.

Arthur R. Jensen. Bias in Mental Testing, New York, The Free Press, 1980.

J. D. Nesbit and N. J. Entwistle. "Intelligence and Family Size, 1949-1965," British Journal of Educational Psychology, 1967, 37:188-193.

Arthur R. Jensen. "Social Class and Verbal Learning," in Social Class, Race and Psychological Development, 115-174, edited by Martin Deutsch, Irwin Katz and Arthur R. Jensen, New York, Holt, Rinehart and Winston, 1978.

Willaim H. Sewell and Robert M. Hauser, Eds. Schooling and Achievement in American Society, New York: Academic Press, 1976. See section in this volume by Sewell and Hauser, "Causes and Consequences of Higher Education: Models of the Status Attainment Process."

CHAPTER 9

Conclusions and Theoretical Implications

9.1. Introduction

Two important research reports to the Center for Population Research, NICHD on only children have been published recently and relevant portions of the conclusions in these reports will be taken into account in respect to the conclusions of this report. It will be interesting to note the similarity of their findings on only children to those reported here. Moreover, this likeness is especially important in view of the fact these studies are based on very different samples.

One of these, a study by Claudy et al., involved 12,400 carefully selected cases from Project Talent participants who were either in the ninth or twelfth grade in 1960 and who responded to a follow-up survey eleven years after their expected date of high school graduation. The other study (Groat et. al.) was a smaple of 9,797 adults selected from the 1973 National Survey of Family Growth. The purpose of this (Groat et. al.) study was to determine the consequences in adult life of having been an only vis-a-vis a sibling child. Our own study, on the other hand, involved data on children and youths who were aged 6-17 at the time the data were collected.

The overall conclusions are as follows. Claudy et. al. (p. 71) noted that few individually significant differences were found between outcomes for only children and individuals from two-child families. Moreover, "when viewing the entire set of results as a whole, it appears that the only child is not disadvantaged relative to individuals from two child families, and may, in fact, be in a slightly advantageous position."

The general conclusion by Groat et. al. (pp. 176-177) is:

> We have documented the fact that among a National probability sample of currently married men and women there are very few significant differences in a series of behavioral outcomes by whether or not the adults grew up as only rather than sibling children. Moreover, the few significant differences that did emerge, such as educational attainment, showed only children at somewhat of an advantage over their sibling counterparts. The decision to have more than one child, then, in order to avoid having an only child, would seem to be misplaced. No evidence was found of any negative consequences for onlies, compared to siblings, in patterns of behavior in adult life.

The purpose in citing the overall conclusions of the two foregoing studies on the effects of being reared an only child on adult life is that these conclusions are virtually the same as our conclusions for children and youth aged 6-17. The similarity of the conclusions reported in these three researches are reinforcing and complementary.

Though we were unable to find significant differences in patterns of behavior and intellectual development of only children compared to sibling children we were successful in identifying a number of significant correlates of behavior development irrespective of birth order and family size. These results are summarized below.

9.2. Types of Data Comparisons

The principal purposes of this research was to determine the consequences of being reared an only child compared to sibling children. The data involved a representative national sample of non-institutionalized children aged 6-11 and a similar sample of youth aged 12-17. Part of the families sampled contained two or more children or youth of the same parents. We labeled these the "sibling sample." This permitted a more rigorous test of birth order effects. In addition, some of the children in Cycle II were also included in Cycle III and were therefore tested at two different time periods. This permitted us to make comparisons on rates of development over a significant time span. In summary, we have three important data base comparisons: In the cross-sectional data all children who were only children, first born children, etc. were contrasted with later born children; secondly, within family comparisons among siblings and finally longitudinal comparisons of differences over times could also be made from appropriate subsamples of the original sample. The cross-sectional comparisons on say, all first borns, etc. are confounded by differences in parental genotypes and socioeconomic status differences among families. Almost all existing birth-order studies have had this defect in some degree. To control for this we did two things. One, we conducted a multiple linear regression analysis using dummy variables and controlled for level of education of the parents, family size, family income and several other variables. This, of course, controlled for between family differences on these important variables. Secondly, we tested for birth order effects between and among siblings. This provided a more precise test since differences among children and youth of the same parents were tested.

Finally, we were interested in testing for stability of effects of the independent variables on the dependent variables over time. That is, if one sub-population of children were reared in an advantageous environment compared to another sub-population reared in a poor environment do the effects cumulate over time, and therefore, widen the differences in development or do the differences remain relatively the same? We called this sub-population the longitudinal sample since it involved the subjects who were measured in both samples, that is, at two different points in time.

9.3. Findings for the Cross-Sectional Sample

Only children scored among the highest on both intelligence and achievement tests. We did not observe the so-called "only child exception," that was statistically significant. The same was true of all the other dependent variables tested. Neither being an only child nor birth order correlated significantly with social development, psychological adjustment, or physical growth.

The specific or detailed findings for the children aged 6-11 were that the proportion of explained variance for verbal intelligence was .3614. Six factors accounted for almost all of the explained variance. These were: level of father's and mother's education, presence of father and mother in the home, mother's age at birth of child, family size and race.

The results for the children's non-verbal intelligence test score were similar, but the degree of correlation was less. The explained variance was .2175 compared to .3614 for the verbal. The statistically significant explanatory variables were: presence of father, father's level of education, mother's level of education, and race.

For the youth aged 12-17 the explained variance for the verbal intelligence test score was slightly over three percent more than that for the children, namely .3921 compared to .3614. The significant factors were again presence of father, level of education of father and mother, family income, race, and birth order as indicated by the child's birth certificate. The sample correlation for birth order was -.2981 and the partial correlation for birth order was -.1290. Thus a small birth order effect is present for verbal intelligence for the youth sample, but not for the children. Most of this relationship seems to be among the middle-born youth and this is positively intercorrelated with family size (.2653). Thus this result is likely owing to uncontrolled differences in family size.

A birth order effect did not show up among the youth for the non-verbal intelligence test. The total variance explained for this test for youth was about the same as for the children, namely .2071 for the youth sample and .2175 for the children's sample. Again, the principal explanatory variables for youth's non-verbal intelligence were: presence of father, level of father and mother's education, family income and race.

The results for the WRAT achievement tests for reading and arithmetic are similar to the results for the Wechsler Intelligence Test except that the proportion of the variance explained is greater for the achievement tests for both Cycle II and Cycle III. Also, as with the intelligence test scores, the correlations are higher for the youth sample than for the sample of children.

The total explained variance for the children's sample for reading achievement is .4317 and almost all of this is accounted for by three variables, namely, the child's I.Q. score, level of father's education and time spent by the child reading books. For the youth sample the proportion of explained variance was .5689 and almost all of this was accounted for by the youth's I.Q. score and parents level of education.

The results for achievement in arithmetic for the sample of children showed child's I.Q. and father's education to result in an explained variance of .3741 while the total explained variance was .3867. For the youth sample, the total explained variance was .4777, and three factors, youth's I.Q., youth's educational aspiration and race produced an explained variance of .4653 which is almost all of the total variance explained. Race did not show up in the children's sample, but showed up among the youth for arithmetic achievement, but not for reading. The level of parental education is the most powerful explanatory variable in accounting for the intelligence and achievement tests scores for both the sample of children an youth. In the multiple regression of 32 variables on the Wechsler Verbal I.Q. of the children the total explained variance was .3614. It is of interest to observe that level of education of father and mother yielded an R^2 of .2511 while the other 30 variables added only 11 percent more to the total explained variance. For the youth sample the total explained variance was .3921 for the Wechsler verbal score and the level of parental education produced an explained variance of .2906, hence the remaining 30 variables added only 10% to the explained variance.

Parents education may be viewed as a rough substitute variable for parents I.Q. Estimates from other studies suggest that the average correlation between parents' intelligence and the intelligence of their children is a little less than .50 (Fuller & Thompson, p. 295).

Significantly, the child's I.Q. and the level of education of the father produce an explained variance of .4000 in the child's reading achievement out of a total variance explained of .4317. For the sample of youth the total variance explained was .5689 and of this the factors of the child's I.Q. and level of parental education explained .5311 or 93 percent of the total variance explained.

9.4. Results of Analysis of Sibling Scores

The results summarized thus far were obtained from the cross-sectional data. These results indicate that birth order and family size do not explain any significant portion of the variance in I.Q. and achievement test scores of children and youth. Level of parental education is the most powerful explanatory variable in the set of independent variables.

Finally, it is of interest to note that the initially observed birth order effects under conditions of no controls, disappears when the control variables are introduced. Thus it appears that under proper controlled conditions multiple linear regression techniques can permit rigorous results from cross-sectional birth order data. As a more definitive test of the frequently found birth order effect we tested for differences among siblings.

The comparison of I.Q. achievement test scores among siblings has the advantage of controlling more effectively for genetic and socioeconomic differences between families since all comparisons involve differences in scores between or among siblings within a family.

The results for the children aged 6-11 clearly showed no significant differences by birth order of siblings for I.Q. and achievement test scores.

For the youth, aged 12-17, a small birth order effect is observed showing first borns obtaining higher I.Q. and achievement test scores than second borns, second borns higher than third, fourth and fifth borns. But there the differences stopped. This was found also by the regression analysis of the youth.

9.5. The Longitudinal Analysis

The purpose of this analysis was to test to see if the differences among birth order groups and the differences between blacks and whites were stable over time. Phrased differently one may ask, if the rates of cognitive development of the different groups were different over time? For example, did the initial differences between blacks and whites remain the same, increase or decrease over time? This question was analyzed in detail in the latter part of Chapter 7. The results for the Wechsler verbal and non-verbal tests showed no change over time for the differing birth order groups or for blacks and whites.

However, blacks showed a significant decline relative to whites on the achievement tests for reading and arithmetic.

These results on the I.Q. test suggest that even though the blacks experience a relatively greater disadvantaged environment than whites, they are able to maintain their relative position to whites in spite of this. That is to say there is no cumulative effect over time. However, this does not hold for school achievement. On the reading and arithmetic tests the blacks showed a decline in scores relative to whites over time.

We need to make one final observation regarding the stability of group I.Q. test scores. Though significant changes under certain conditions have been observed in individual I.Q. scores over time they tend in general to be stable and especially so with group differences (Murphy, 1951, pp. 352-354). In our study, it is significant to note that whatever the factors are that produced mean differences in the I.Q. scores by socioeconomic status and by race that these differences had reached their greatest gap by age six and remained essentially constant through age seventeen. This underscores the great importance of early experience and conditions for development of intellectual potential. The analysis we conducted on the effects of extreme environmental differences on cognitive development is relevant to this issue.

9.6. Effects of Extreme Environmental Differences

Sandra Scarr-Salapatek, 1971, states that:

> The environmental disadvantage hypothesis predicts that I.Q. scores within advantaged groups will show larger proportions of genetic variance and smaller proportions of environmental variance than I.Q. scores for disadvantaged groups. Environmental disadvantage is predicted to reduce the genotype-phenotype correlation in lower class groups and in the black group as a whole.

She further states that "if disadvantages were equally distributed across social class and racial groups, the social class and racial correlations with I.Q. would disappear."

In leading up to the above propositions, Scarr makes an important distinction that is worth repeating here. She notes that:

> Social class groups . . . are subdivisions of races and represent different distributions of parental genotypes, as well as different rearing environments. There is no

> comparable statement that can be made about racial groups: Whereas, races represent different rearing environments, no statements can be made concerning different distributions of parental genotypes for I.Q. Since there is no direct test possible for distributions of genotypic I.Q., it is impossible to assert that such distributions are "equal" or "different."

In our own study we analyzed I.Q. development of blacks and whites under advantaged and disadvantaged conditions. The advantaged condition was defined as children whose parents had one year or more of college education, and disadvantaged environment was defined as children reared by parents with five or less years of formal education. The detailed results were shown in Tables 7.2.17. and 7.2.18. and they are very interesting.

Comparing first blacks and whites aged 6-11 we note that in the advantaged environment family size, race, income and mother's age at birth of child all produce significant Beta values. However, for the disadvantaged environment only family size makes a significant contribution and the racial factor drops out. These results tend to confirm Scarr's prediction that as race and social class are equalized the correlation of class and race with I.Q. will disappear. This is certainly true in the disadvantaged group reported here, but it is not true in the "equal" advantaged group. Given the conditions of education for blacks and whites in the 1930's-1950's it is quite likely that 13 years or more of education for black parents was not equal to 13 years or more of education for white parents. Moreover, being black in the United States may carry with it a social burden not experienced by any white. We may note, however, that the results of the disadvantaged environment in our study do not support this assumption.

Nevertheless, it is important to note that under the condition of five years or less of parental education for blacks and whites that race is not correlated with I.Q. for the children aged 6-11 or the youth aged 12-17, but it is correlated under the favorable environmental situation, i.e., 13 years or more of parental education.

Finally, for the disadvantaged group, family income becomes the most significant variable for the youth sample with family size next in importance. Thus, income for the disadvantaged group becomes critical for the youth but is not a significant variable for the sample of children.

There were four hypotheses that guided our research. All four were affirmed.

1. It was hypothesized that the simple correlation between birth order and I.Q. development would disappear when parental education, family size, income, and presence or absence of father and mother in the family were taken into account. This hypothesis was affirmed.

2. Regarding differences in mean I.Q. scores of blacks and whites it was predicted that under extreme disadvantaged conditions the I.Q. scores of blacks and whites would not differ significantly. This was affirmed. We also predicted that under the condition of an advantaged environment that the phenotypic differences would be significant by race. This was affirmed.

3. The third hypothesis is more of an axiom underlying hypothesis two than a true hypothesis or theorem. It stated that different groups experienceing a deprived environment compared to groups experiencing an enriched one will show fewer factors correlated with I.Q. development

than the same types of groups in an enriched environment. This was affirmed also.

4. The final hypothesis was that the rates of I.Q. development over time for different socioeconomic and racial groups would not differ. This was affirmed.

This study has demonstrated quite clearly the importance of quality of the family environment as measured by the educational level of the parents in explaining the differential cognitive development of children and youth. From this it would follow that the most likely successful strategy for breaking the cycle of failure in cognitive development is to insure that the parents of tomorrow are better educated today. This would also help foster the disappearance of negative attributions or stereotypes of minority groups that impede their cognitive and social development. Progress in this area appears slow, but in retrospect it is faster than one might suspect as the following quotation on blacks from a speech by President William H. Taft illustrates.

In 1909 the newly inaugurated President Taft speaking before a group of Black college students in Charlotte, North Carolina said: "Your race is adapted to be a race of farmers, first, last and for all times" (Logan 1957, p. 66).

Finally, this study and the two studies on only borns cited at the beginning of this chapter clearly show that being reared as an only child is in no way a developmental handicap. If anything, it provides a slight advantage in today's world. Therefore, if parents elect to have more than one child, because they think being an only child is a developmental liability, then they are doing so on unwarranted bases.

BIBLIOGRAPHY

John S. Claudy, William S. Farrell, Jr. and Charles W. Dayton, The Consequences of Being an Only Child: An Analysis of Project Talent Data, Final Report, Contract No. NO1-HD-82854, December 1979, NICHD, Washington, D.C.

H. Theodore Groat, Jerry W. Wicks and Arthur G. Neal, Differential Consequences of Having Been an Only Versus a Sibling Child, Final Report, Center for Population Research, Contract NIH-NO1-HD-92806, April 1980, NICHD, Washington, D.C.

John L. Fuller and William R. Thompson, Foundations of Behavior Genetics, The C.V. Mosby Co., Saint Louis, 1978.

Gardner Murphy, An Introduction to Psychology (New York, Harper & Row, 1951) pp. 352-354.

Sandra Scarr-Salaptek, "Race, Social Class and I.Q.," Science, vol. 174, No. 4016, pp. 1285-1295.

R. W. Logan, The Negro in the United States. Princeton, N.J.: Van Nostrand, 1957. Cited by Lawrence S. Wrightsman, Social Psychology, Second Edition, Monterey, Calif., Brooks/Cole Publishing Co., 1977, p. 475.

CHAPTER 10

Implications For Future Research

10.1. Introduction

The findings reported in this research are important for both industrially developed nations and for the less developed nations. Moreover, the implications for new research in this respect are equally or more important.

For industrialized nations, the question of population growth and continued increase in levels of affluence is of major concern. There are those who take the "limits to economic and technological growth" perspective as the road to the future. They argue that unless population growth is curtailed individual affluence will decline since economic and technological growth must be reduced for ecological reasons. Then there are those who argue that continued economic and technological growth are not only possible, without serious environmental damage, but are necessary.

For the developing nations the concerns are different. They are primarily concerned with the modernizing and industrializing in order to gain now a better life for their people. The argument for the need to reduce the rate of population growth on a world-wide basis is generally accepted as a necessary condition for the future development of the less developed nations and a highly desirable condition for the developed nations.

The older developed nations industrialized under the conditions of an abundance of cheap energy and a declining fertility rate. The less developed nations today are attempting to industrialize under opposite conditions, namely, scarce and extremely expensive energy and in many cases an increasing fertility rate, but in all cases, relatively speaking, a very high rate of fertility. The wealth of nations presupposes an abundance of economically feasible energy, the technology to utilize this, and a motivated and skilled population to produce at high rates of productivity. Moreover, for per capita wealth to increase, the rate of economic growth must exceed the population growth of the society. Accordingly, it is the quality of a population that is paramount in high technology and post-industrial societies as well as in contemporary societies that are attempting to modernize and industrialize.

10.2. Implications

Given the above argument, and the findings reported in this research report, what new research problems are suggested?

This report clearly shows that higher cognitive development and achievement are related positively to the level of education of the parents and the family income and that, in general, these two are negatively related to family size. Level of education and motivation to achieve are important variables essential for modernization in a developing society as well as for economic productivity in a developed society. Obviously, fertility beyond a family's capacity to provide for the health and intellectual development of it's children is a maladaptive condition. The following are therefore, important research questions:

1) What are the determinants of the relatively higher rates of fertility among minorities, ethnic and racial groups, as well as among low socioeconomic status groups irrespective of ethnicity in the United States? 2) What are the contraceptive practices of these groups and what are the comparative rates of contraceptive failure? 3) Additional research needs to be conducted to determine the I.Q. level of the parents and then measure their effects on the I.Q. development of the children.

Moreover, educational achievement is becoming essential in modern industrial and post-industrial societies for the economic well-being of the society and especially for social mobility. Some children from large families among low socioeconomic groups are high achievers, ambitious and successful. 4) It is important to contrast them with the other children of the same families and similar children of low income families who are low achievers and have low aspiration to determine what are the factors that enable some children to escape poverty.

This study also found that I.Q. differences between black and white children whose parents had five or less years of education were not significant. However, there were significant differences among black and white youths whose parents had 13 or more years of education. In our study, the parents of these youth were educated in the 1930's and the 1940's. The educational institutions, at that time, for blacks were clearly less efficient and effective than the same for whites. 5) Therefore it would be important to test the effects of higher levels of parental education on the I.Q. of children of blacks and whites under the condition of integrated education. If equal levels at the higher level of education resulted in the elimination of the black-white

I.Q. difference this would be an important finding.

Another finding reported in our research was the constancy of the relative difference in I.Q. scopes among racial and socioeconomic groups from ages 6-17. 6) Therefore, it is important to know if these differences existed at or early after birth or did they emerge somewhere between birth and age five and become relatively stable by age six? If the group differences emerged significantly after birth this would suggest a modifiable environmental condition as the principal course.

Finally, 7) with the growing number of single-parent families it is important to ascertain if this condition affects negatively cognitive development and gender identity.

We have refrained deliberately from proposing strategies or research designs for researching the foregoing seven problem areas. This would be the responsibility of those submitting specific research proposals.

Appendix I(a)

Available Data Items in Cycle II

A. CONTROL INFORMATION . . . .

1. Sample sequence number
2. Number of contacts with parent or guardian
3. Final adjusted weight (for pop. estimates)
4. Date of examination (Month, day, year)
5. Date of birth (month, day, year)

B. BACKGROUND CHARACTERISTICS OF EXAMINED CHILD . . . .

Personal

1. Sex
2. Race
3. Sex - race recode
4. Age in years (at time of examination)
5. Age - sex recode
6. Age in 6 month intervals
7. Age (in 4 month intervals at time of exam.)
8. Age (in months at time of exam.)
9. Grade in school
10. Twin status

Demographic

1. Region
2. Population size
3. Rate of population change (1950-1960)
4. Size of place
5. SMSA - not SMSA
6. Land usage

Family

1. Family income (annual)
2. First listed parent or guardian relationship to child
3. Second listed parent or guardian relationship to child
4. Parental relationship to child of 1st and 2nd listed parents
5. Education of 1st listed parent - completed years
6. Education of 2nd listed parent - completed years
7. Race of 1st listed parent
8. Race of 2nd listed parent
9. Sex of 1st listed parent
10. Sex of 2nd listed parent
11. Age of 1st listed parent (at time of interview)
12. Age of 2nd listed parent (at time of interview)

13. Place of birth of 1st listed parent
14. Place of birth of 2nd listed parent
15. Handedness of 1st listed parent
16. Handedness of 2nd listed parent
17. Usual activity of 1st listed parent
18. Usual activity of 2nd listed parent
19. Marital status of 1st listed parent
20. Marital status of 2nd listed parent
21. Other children not living in household
22. Number of persons in household 20 years of age or less
23. Age order of child (among persons in household 20 years of age or less)
24. Total number of persons in the household
25. Foreign language spoken in the home

Marital History of Husband and Wife

1. Year of last (or only) marriage
2. Year latest marriage terminated

Wife

3. Present marital status
4. Year wife's previous marriage terminated
5. Reason for termination of wife's previous marriage
6. Total marriages of wife

Husband

7. Present marital status
8. Year previous marriage terminated
9. Reason for termination of previous marriage
10. Total marriages

Household Health Episodes over Past 10 Years

1. Someone in a hospital, institution, etc. for more than a three-month period
2. Year of occurrence of episode #1
3. Someone confined to be at home for more than a three-month period
4. Year of occurrence of #2 episode
5. Someone unable to work or carry on usual activities for more than a six-month period
6. Year of occurrence of #3 episode
7. Someone died while living in household
8. Year of occurrence of episode #4

C. BIRTH CERTIFICATE INFORMATION . . . .

1. Birth Certificate Information Available
2. State of birth
3. Place of birth
4. Residence of mother
5. Age of father
6. Age of mother
7. Birth place of father

8. Birth place of mother
9. Race of father
10. Race of mother
11. Number of children (born to mother)
12. All other children now living
13. All other children born alive, now dead
14. All other children born dead (includes fetuses born dead anytime after conception)
15. Attendant at birth
16. Length of pregnancy
17. Weight at birth
18. Number at birth
19. Birth order - multiple births
20. Legitimacy
21. Congenital malformation
22. Complications of pregnancy and labor
23. Birth injury
24. Prophylactic drug used in eyes
25. Induction attempted

D. CHILD'S MEDICAL HISTORY . . . .

Parent Form

1. Born in hospital
2. Length of stay of mother in hospital
3. Length of stay of baby in hospital
4. Weight at birth
5. Arrival of baby as expected
6. If early, how early
7. Anything wrong with baby
8. Any medical problems or complications during pregnancy
9. Previous pregnancies
10. Doctor seen during pregnancy
11. Months pregnant when first saw doctor
12. Times doctor seen
13. Trouble with pregnancy or birth
14. Health of baby at one year
15. Anything wrong with child as a baby
16. Doctor seen about this problem
17. Breast fed
18. Months breast fed
19. Acceptance of change from breast feeding
20. Age first walked
21. Age spoke first real word
22. Learning speed
23. Attend kindergarten or nursery school
24. Child's present health
25. Current health problem(s) of child that worries parent
26. Thumb sucked at present time
27. Frequency of thumb sucking
28. Regular medicine

29. Medicine under doctor's orders
30. Bed wetter at present time
31. Frequency of bed wetting
32. Broken bones
33. Knocked unconscious
34. Scar from burn
35. Other accident
36. Tonsils out
37. Other operations
38. Hospitilization for other sickness or trouble

Childhood Diseases

39. Scarlet Fever
40. Rheumatic Fever
41. Polio
42. Diptheria
43. Meningitis or Sleeping Sickness
44. Tuberculosis
45. Diabetes or Sugar Diabetes
46. Epilepsy
47. Chorea or St. Vitus Dance
48. Cerebral Palsy
49. Whooping Cough

Other Illnesses or Conditions

50. Asthma
51. Hay Fever
52. Any other kinds of allergies
53. Any trouble with his (her) kidneys
54. A heart murmur
55. Anything wrong with his (her) heart
56. A convulsion
57. A fit
58. Measles
59. Age had measles
60. Sick longer than usual (measles)
61. Hospitalized for measles
62. Fever more than week (measles)
63. Sleepy after measles
64. Mumps
65. Age had mumps
66. Sick longer than usual with mumps
67. Hospitalized with mumps
68. Fever more than week with mumps
69. Sleepy after mumps
70. Sore throats
71. Colds
72. Coughs
73. Bronchitis
74. Chest colds
75. Crossed eyes

76. Operation on eyes
77. Other eye trouble
78. Wear glasses or contact lens
If not worn:
79. Have trouble reading
80. Eyelids swell-up or turn red
81. Styes, infections or "matter" in eyes
82. Eyes water
83. Eyes bloodshot
84. Eyes burn or itch
85. Bright light bother eyes
86. See doubles or blurred vision
87. Rub or blink eyes when reading
88. Close or cover one eye or hold head to one side while watching T.V. or reading
89. Hearing trouble
90. Ear aches
91. Injury to ears
92. Eardrums opened or lanced
93. Number of times opened
94. Other ear operations
95. Running ear
96. Frequency of running ear
97. Left, right or both ears run
98. Other ear trouble
99. Talking problem
100. Nature of talking problem
101. Trouble walking
102. Arm or leg weakness or paralysis
103. Health restricted activity ever
104. Activity restricted by doctor
105. Is child presently restricted
106. Last time child been to doctor
107. Last time child been to dentist
108. Ever had teeth straightened or bands on teeth
109. Do teeth need straightening
110. Usual time goes to bed when has school the next day
111. Affect T.V. or radio plays on child's sleep
112. Bad dreams or nightmares
113. Walk in sleep
114. Slept overnight at friend's
115. How often slept overnight
116. Sleeping arrangement at home
117. Child afraid of dark
118. Girls monthly periods started (year)
119. Age periods started (month)

Interviewer Medical History Form
120. Form information availability
121. Number meals eaten yesterday with other
122. Amount of food eaten

123. Selectivity of foods
124. Number of meals usually eaten with family
125. Does child have regular tasks or duties
126. Does child have pet and care given
127. Number of friends
128. Comparative age of friends
129. How many friends parent knows
130. How child reacts to meeting new children
131. How well gets along with others
132. Ever run away from home
133. Reason given for running away
134. Anything ever seriously upset or disturb child
135. Age child at disturbance
136. Tension rating
137. Temperament

Participation in:

138. Scouts, etc.
139. Church activities
140. Little league, etc.
141. Fine arts
142. Other activities
143. Time spent away from home without knowing whereabouts

Time spent on usual day:

144. Watching T.V.
145. Listening to radio
146. Reading newspapers, comics, magazines
147. Reading books (except comic books)
148. With friends
149. Playing by self
150. Working
151. Trouble getting child to go to bed
152. Trouble getting child to go to sleep
153. Trouble getting child to take a nap (when little)
154. Child's best and worst points

E. SCHOOL QUESTIONNAIRE . . . .

1. School Questionnaire Information Availability
2. Grade qualification given
3. Grades skipped
4. Grade(s) repeated
5. Reason for repeating
6. School absenteeism
7. Reason for unusual absenteeism

Special resources recommended, available, and use:

8. Hard of hearing
9. Sight saving
10. Speech therapy

11. Orthopedically handicapped
12. Gifted
13. Slow learner
14. Mentally retarded
15. Emotionally disturbed
16. "Other" resource
17. Any resource recommended
18. Adjustment evaluation
19. Attention span
20. Restlessness in class
21. Frequently accused of fighting
22. Too rough
23. Frequently injured
24. Too aggressive
25. Uses bad words
26. Other parents complain
27. Discipline not working
28. No basis for judging
29. None of the above
30. Frequency of disciplinary action
31. Frequency of being chosen in "choosing sides"
32. Frequency of chosen as leader
33. Intellectual ability
34. Academic performance
35. Time known by rater
36. Capacity rater knew child

F. PSYCHOLOGICAL EXAMINATION . . . .

1. WISC Vocabulary raw scores
2. WISC Block Design raw scores
3. WISC Vocabulary and B.D. Test Qualification
4. WRAT Reading raw scores
5. WRAT Arithmetic raw scores
6. WRAT Test level given
7. WRAT Reading and Arithmetic Test Qualifications
8. Harris-Goodenough raw scores
9. H-G Sex of drawing by sex of child
10. H-G Class A drawing
11. H-G Test Qualifications
12. Handedness by psychologist
13. Foreign language problem

Normalized T-Scores

14. Vocabulary
15. Block Design
16. Reading
17. Arithmetic
18. Draw-a-Person

Composites Derived from T-Scores

19. Vocabulary plus Block Design
20. Reading plus arithmetic
21. All 5 tests' T-score
22. Intellectual Development
23. Index of Educational Achievement
24. Composite Index of Measured Performance (all 5 tests)
25. Descriptive Levels of Intellectual Development

Standard Deviation Scores

26. WISC Vocabulary
27. WISC Block Design
28. Deviation I.Q. estimate
29. WRAT Reading
30. WRAT Arithmetic
31. Composite WRAT standard scores
32. H-G Draw-a-Person Test

WRAT Grade Equivalents

33. Reading
34. Arithmetic

WISC Manual Standard Scores

35. Vocabulary Test
36. Block Design test
37. Sum of Vocabulary and Block Design
38. Estimated WISC Full Scale I.Q. - Mercer formula
39. Estimated WISC Full Scale I.Q. - Equipercentile
40. Descriptive categories of Estimated I.Q. - Equipercentile

G. PHYSICAL EXAMINATION . . . .

1. Temperature
2. Pulse rate

General Appearance

3. Tics or mannerisms
4. Finger sucking
5. Nail biting
6. Axillary hair
7. Breast development

Eyes

8. Findings
9. Stye
10. Conjunctivitis
11. Blepharitis
12. Strabismus
13. Manifest - Right
14. Manifest - Left
15. Latent - Right
16. Latent - Left

17. Observation
18. Moving light
19. Hirschberg Test
20. Screen test

Blood Pressure

21. Systolic (1)
22. Diastolic (1)
23. Systolic (2)
24. Diastolic (2)
25. Average Systolic
26. Average Diastolic
27. Average Systolic B.P.
28. Average Diastolic B.P.
29. Neuromuscular and joint summary
30. Extremities
31. Point of maximum impulse
32. Midclavicular line
33. Trills
34. a. Systolic - Diastolic
35. b. Base - Apex

Sounds at Base

36. a. Murmur
37. b. Murmur (significance)
38. c. Other murmurs
39. ECG
40. Chest X-ray
41. History (of heart condition)

H. EAR, NOSE AND THROAT EXAMINATION . . . .

External Ear

1. Right ear
2. Left ear
3. Pinna - right ear
4. Pinna - left ear
5. Auricular region - right ear
6. Auricular region - left ear
7. Auditory canal - right ear
8. Auditory canal - left ear
9. Occluded right ear
10. Occluded left
11. Drum right ear
12. Drum left ear
13. Drum mobile - right ear
14. Drum mobile - left ear
15. Dull - right ear
16. Dull - left ear
17. Transparent - opaque; right ear

18. Transparent - opaque; left ear
19. Bulging - retracted; right ear
20. Bulging - retracted; left ear
21. Coloration - right ear
22. Coloration - left ear
23. Perforated - right ear
24. Perforated - left ear
25. Scars - right ear
26. Scars - left ear
27. Tonsils
28. Oral Pharynx (evaluation)
29. a. Cleft palate
30. b. Hypertropic Lymphoid tissue
31. c. Heavy post-nasal discharge
32. d. Other oral pharynx

Nose

33. Right (eval.)
34. Left (eval.)
35. Deviated Septum - right
36. Deviated Septum - left
37. Hypertrophy of Turbinates - right
38. Hypertrophy of Turbinates - left
39. Polyps - right
40. Polyps - left
41. Obstruction - right
42. Obstruction - left
43. Profuse discharge
44. Swollen tissue
45. Mouth breathing
46. Other (nose)

I. DIAGNOSTIC IMPRESSIONS . . . .

1. Overall evaluation of findings
2. Accidents or injuries
3. Heart disease
4. a. congenital or acquired
5. Neurological, muscular, and joint condition
6. Type of neurological, muscular and joint condition
7. Neurological muscular and joint condition
8. Other congenital abnormalities
9. Other major diseases
10. Summary of Medical Report to Parent or Private Physician

J. AUDIOMETRY - HEARING . . . .

1. Conditions affecting test results
2. Decibel levels at various C.P.S.

K. VISION . . . .

1. Wears glasses for test
2. Color vision test given
3. Score on C.V. Test #1
4. Screening score C.V. Test #2
5. C.V. Severity R-G
6. C.V. Severity B-Y
7. Binocular Distance Acuity
8. Binocular Near Acuity
9. Monocular Distance - right eye
10. Monocular Distance - left eye
11. Monocular Near - right eye
12. Monocular Near - left eye
13. Lateral Phoria Distance
14. Vertical Phoria Distance
15. Lateral Phoria near

L. DENTAL EXAMINATION . . . .

1. Number of permanent teeth
2. Number of decayed permanent teeth
3. Number of filled permanent teeth
4. Total number DMF - permanent
5. Number of decayed primary teeth
6. Number of filled primary teeth
7. Number needing extraction - primary
8. Total number of primary teeth decayed, filled, needing extraction
9. Number of permanent teeth present
10. Number of primary teeth present
11. Number of permanent teeth erupted
12. Periodontal index
13. Gingivitis and periodontal pockets
14. Simplified debris index
15. Simplified calculus index
16. Simplified oral hygiene index

16a. Malocclusion syndrome

17. Examination qualification
18. TPI
19. Buccal Segment Relation (right)
20. Buccal Segment Relation (left)
21. Posterior crossbite
22. Number upper right teeth - buccal
23. Number upper right teeth - lingual
24. Number upper left teeth - buccal
25. Number upper left teeth - lingual
26. Incisor vertical relationship
27. Overjet
28. Mandibular protrusion

29. Overbite
30. Openbite

Number of Malaligned Teeth

31. Upper Anterior
32. Upper Posterior
33. Lower Anterior
34. Lower Posterior
35. Orthodontic appliances

M. BODY MEASUREMENTS . . . .

Sitting Measurements

1. Foot length
2. Foot breadth
3. Knee height
4. Popliteal height
5. Thigh clearance
6. Seat breadth
7. Elbow - elbow breadth
8. Sitting height
9. Buttock - popliteal length
10. Buttock - knee length
11. Elbow - wrist length
12. Hand length
13. Hand breadth

Standing Measurements

14. R. bicondylardiameter
15. R. calf girth
16. Standing - height
17. Biacromail diameter
18. Acromion to olecranon
19. Chest breadth
20. Chest depth
21. Bicristal diameter
22. Chest girth
23. Waist girth
24. Hip girth
25. R. upper arm girth
26. R. lower arm girth

Skin Folds

27. R. upper arm
28. R. infrascapular
29. R. lateral chest wall

Weight

30. In pounds
31. In kilograms

32. Height in cm. coded
33. Weight in kg. coded

Grip Strength

34. Right hand - max. of 3 trials
35. Left hand - max. of 3 trials
36. Handedness
37. Grip strength test satisfactory

Appendix I(b)

Available Data Items in Cycle III

A. CONTROL INFORMATION . . . .

1. Sample sequence number
2. HES Cycle II sample sequence number
3. Date of examination
4. Date of birth
5. Final adjusted sample weight

B. PERSONAL AND DEMOGRAPHIC CHARACTERISTICS OF EXAMINED YOUTH. . . .

Personal

1. Sex
2. Race
3. Sex-race recode
4. Age in years at time of examination
5. Age-sex recode
6. Age in 6-month intervals
7. Age in 4-month intervals
8. Age in 1-month intervals
9. Highest grade youth attended in school
10. Did youth finish this grade
11. Youth going to school
12. Not going to school - job status
13. Present grade status
14. Twin status

Demographic

1. Region
2. Population size
3. Rate of population change
4. Size of place
5. SMSA-not SMSA
6. Land usage

Family

1. Total family income (annual)
2. Parent or guardian relationship to youth (1st listed parent)
3. Parent or guardian relationship to youth (2nd listed parent)
4. Parental relationship to youth of 1st & 2nd listed parents
5. Highest grade finished (1st listed parent)
6. Highest grade finished (2nd listed parent)
7. Sex and race (1st listed parent)
8. Sex and race (2nd listed parent)

9. Age (1st listed parent)
10. Age (2nd listed parent)
11. Place of birth (1st listed parent)
12. Place of birth (2nd listed parent)
13. Handedness (1st listed parent)
14. Handedness (2nd listed parent)
15. Usual activity (1st listed parent)
16. Usual activity (2nd listed parent)
17. Marital status (1st listed parent)
18. Marital status (2nd listed parent)
19. Other children (not living in household)
20. Number of persons in household (20 years of age or less)
21. Age order of youth (in household 20 years or less)
22. Total number of persons in household
23. Foreign language spoken in home

Household Health Episodes Since Oldest Examined Youth Born

1. Household health episode reported
2. Anyone in hospital, etc., and who
3. Year of occurrence (1st episode)
4. Anyone unable to work, etc., and who
5. Year of occurrence (2nd episode)
6. Any relative died and who
7. Year of occurrence (3rd episode)

C. BIRTH CERTIFICATE . . . .

1. Birth certificate information available
2. State of birth
3. Place of birth
4. Residence of mother
5. Age of father
6. Age of mother
7. Birthplace of father
8. Birthplace of mother
9. Race of father
10. Race of mother
11. All other children now living
12. All other children born alive, now dead
13. All other children born dead
14. Attendant at birth
15. Length of pregnancy (in weeks)
16. Weight at birth (in pounds and ounces)
17. Number at birth
18. Birth order - multiple births
19. Legitimacy
20. Congenital malformation
21. Complications of pregnancy or labor
22. Birth injury
23. Prophylactic drug used in eyes
24. Induction attempted

D. MEDICAL HISTORY OF YOUTH FROM PARENT . . . .

1. Medical history availability
2. Born in a hospital
3. Problems during pregnancy or delivery
4. Anything wrong with baby at birth
5. Difficulty with child before age 1 year
6. Doctor consulted about difficulty
7. Serious health problem since 1 year of age
8. Health problem(s) of youth that worries parents now
9. Youth's present health evaluation
10. Medicine used regularly
11. Name of medicine given
12. What medicine given used for
13. Is medicine taken under doctor's orders
14. Any bones ever broken
15. Every any serious accidents or injuries
16. How many serious accidents or injuries
17. Was youth hospitalized for accident or injury
18. Ever been unconscious
19. How long was unconscious
20. Operations
21. Hospitalized overnight or longer
22. Longest time ever spent in hospital
23. How old when in hospital longest time
24. Did adult member of family spend the night at hospital with youth

History of Diseases

25. Measles
26. Mumps
27. Chickenpox
28. Whooping cough
29. Scarlet fever
30. Asthma
31. Hay fever
32. Other allergies
33. Kidney trouble
34. Heart murmur or anything else wrong with heart
35. Fit, convulsion, or seizure
36. Pneumonia
37. Diabetes or Surgar Diabetes
38. Rheumatic Fever
39. Polio
40. Epilepsy
41. Chorea of St. Vitus' Dance
42. Diphtheria
43. Tuberculosis
44. Cerebral Palsy
45. Meningitis or Sleeping Sickness
46. Most serious illness or disease (I.C.D. Code)

47. Age when illness started
48. Seriousness of above illness or disease
49. Any lasting effects from above illness or disease
50. Bed wetting during past year
51. Does youth wear glasses or contact lenses
52. If no; does youth need glasses
53. Youth ever had eye trouble
54. Any eye operations
55. Any injury to ears
56. Ear drums opened or lanced
57. How many times ear drums opened or lanced
58. Which ear drum opened or lanced
59. Any other ear operations
60. If yes; which ear
61. Ever have a running ear or discharge from ear
62. If yes; how often
63. If yes; which ear
64. Earache in past year
65. Any difficulty hearing
66. Any other ear trouble
67. Any speech defects now
68. Limp or other trouble walking
69. Anything prevents complete use of legs
70. Anything prevents complete use of arms
71. Exercise or playing now restricted
72. If yes; did doctor advise this
73. Exercise or playing ever restricted
74. Ever had teeth straightened or bands on teeth
75. If no; does parent think they need straightening
76. Does dentist think they need straightening
77. Over-under weight at present
78. Rate of physical growth
79. Rate of mental development
80. How often stayed overnight with friends
81. Did youth attend nursery school
82. Did youth attend kindergarten
83. Was kindergarten attendance compulsory or voluntary
84. Age started first grade
85. First reaction to school at first grade
86. Ease in making friends (at present)
87. How many friends parent knows well
88. How much trouble to bring up
89. How nervous (tense, high-strung) is youth
90. Has youth ever been to a mental hospital or guidance clinic
91. Has youth ever seen a psychiatrist, psychologist, etc.
92. Amount eaten by youth
93. How fussy an eater is youth
94. How many meals youth eats with adult family members

Who Makes Most of the Decisions on

95. Choosing clothes
96. How to spend his money
97. Which friends to go out with
98. How late to stay out
99. Does youth get an allowance
100. If yes; who decides
101. If no; does youth earn money from work
102. Parent's desires on youth's schooling
103. What parent thinks will happen regarding schooling

Importance of Certain Qualities and Characteristics

104. To be neat and clean
105. To be able to defend oneself
106. To have self control
107. To be happy
108. To obey one's parents
109. To be dependable
110. To be considerate of others
111. To face life's problems calmly
112. To obey the law
113. To be ambitious
114. To know how to keep in good health

If Youth had any of the Following Conditions What Would you Want to Do

115. Stomach ache
116. Sore throat
117. Hurt all over
118. Stiff neck or back
119. Headache
120. Vomit
121. Loss of appetite
122. Overtiredness
123. Pain in chest
124. Lump in stomach or abdomen
125. Blood in urine or bowel movement
126. Nervousness
127. How often does youth exaggerate when ill
128. How often parent thinks it's all right for youth to exaggerate
129. Last time youth saw a doctor for a check-up
130. Last time youth seen by a doctor for treatment
131. Last time youth saw a dentist for a check-up
132. Last time youth saw a dentist for treatment

Girls Only

133. Monthly periods started yet
134. If yes; was girl told about periods before they started
135. Age when periods started
136. Pain or discomfort from periods
137. How often when painful

138. How severe is pain or discomfort when present
139. Remedy used to ease pain
140. Has girl talked to a doctor about pain or discomfort
141. Youth's medical history form completed by

E. SCHOOL QUESTIONNAIRE . . . .

1. Record availability
2. Present grade placement of youth as given by school
3. Grade qualification
4. Any grades skipped or double promotions given
5. Any grades repeated
6. Main reason grade repeated
7. Absent from school an unusual number of days
8. Main reason for such absences
9. Frequency disciplinary action required
10. Special resources needed or currently being used
11. For the gifted
12. For the mentally retarded
13. For "slow learners" not classified as mentally retarded
14. For emotionally disturbed
15. For orthopedically handicapped
16. Special facilities for the "hard of hearing"
17. Special facilities for the visually handicapped
18. Speech therapy
19. Remedial reading
20. English for non-English speaking
21. Remedial training in special subject areas
22. "Other" resources needed
23. Adjustment evaluation
24. Intellectual ability evaluation
25. Academic achievement evaluation
26. Popularity with other students
27. Time known
28. Official title of person completing form

F. HEALTH HABITS AND HISTORY - YOUTH QUESTIONNAIRE . . . .

1. Record availability
2. Present health rating
3. Problem(s) to talk over with doctor
4. Use medicine regularly
5. Medicine ordered by doctor
6. Ever broken any bones
7. How many times ever broken any bones
8. Ever any other injuries or accidents
9. Ever knocked unconscious
10. Ever stayed in hospital overnight or longer
11. Youth stayed in hospital overnight or longer for most serious illness or disease
12. Ever wear glasses or contact lenses

13. If yes; can you see as well as most with your glasses
14. If not wearing glasses do you need glasses
15. If wearing glasses do you need new glasses
16. When wears glasses
17. If not all day, when do you wear glasses
18. Anything wrong with eyes (except glasses)
19. Any hearing difficulty
20. Ears ever damaged or injured
21. If yes; which ear
22. Any earaches in the past year
23. Any other ear trouble
24. Teeth need straightening
25. Any difficulty in talking or speaking
26. Anything wrong with the way you walk
27. Anything that prevents complete use of legs
28. Anything that prevents complete use of arms
29. Ever prevented for reasons of health from taking part in hard work, exercise, or games
30. If yes; did doctor advise this
31. If yes; are you now forbidden to exercise or play
32. Overweight or underweight
33. Body build
34. Body build preference
35. Height preference
36. Any backaches in past year or two
37. Sleep alone in own room
38. If no; who else sleeps in room
39. Frequency of trouble getting to sleep or staying asleep
40. Frequency of having bad dreams or nightmares
41. Walked in sleep during past year or so
42. Do you have acne
43. Age when acne started
44. Any treatment used for acne
45. Have you seen a doctor about acne
46. How much does your acne bother you
47. Have you ever been away from home for at least two months
48. If away from home over two months, where stayed
49. Age when first stayed away over two months
50. Are you going to school
51. If yes; how many hours work during school year
52. If no; do you have a job
53. Kind of work (for those going to school and working)
54. Paid for work (going to school and working)
55. Work during vacation (going to school)
56. Get an allowance from family
57. If yes; who decides amount
58. If getting allowance, who should decide amount
59. Are duties or chores performed for allowance
60. Is allowance ever withheld as punishment
61. Amount eaten
62. Last time saw doctor for a check-up

63. Last time saw doctor for treatment
64. Last time saw dentist for a check-up
65. Last time saw dentist for treatment

Number of Hours Per Day Usually Spent

66. Watching T.V.
67. Listening to radio
68. Reading newspapers, comics, magazines
69. Reading books (except comic books)

G. HEALTH BEHAVIOR - YOUTH REPORT . . . .

1. Record availability
2. Document completed by
3. Like to do about school
4. What youth thinks will happen about school
5. Ever had a date
6. If yes; age at first date

Who Makes Decision on Following

7. Choosing your clothes
8. How to spend your money
9. Which friends you go out with
10. How late you can stay out
11. Number of times run away from home
12. Age when ran away from home
13. Number of times in contact with police
14. Arrested if contacted
15. Punished as a result of police contact
16. Age first smoked
17. Age started smoking regularly
18. Number of cigarettes smoked per day
19. Hour usually goes to bed before school or work day
20. Time usually goes to bed
21. Ever feel tense, nervous, or fidgety

Importance for Young Person to Have Qualities Listed Below

22. To be neat and clean
23. To be able to defend oneself
24. To have self-control
25. To be happy
26. To obey one's parents
27. To be dependable
28. To be considerate of others
29. To face life's problems calmly
30. To obey the law
31. To be ambitious
32. To know how to keep in good health

Want to See a Doctor if had any of Following Conditions

33. Stomach ache
34. Sore throat
35. Hurt all over
36. Stiff neck or back
37. Headache
38. Vomit
39. Loss of appetite
40. Overtiredness
41. Pain in chest
42. Lump in stomach or abdomen
43. Blood in urine or bowel movements
44. Nervousness

Want to See a Dentist if had Following Conditions

45. Crooked teeth
46. Sore gums
47. Bad breath
48. A toothache
49. Sores in the mouth
50. Stains on teeth that wouldn't brush off
51. Hole or cavity in tooth even if it didn't hurt

H. PSYCHOLOGICAL EXAMINATION . . . .

WISC (Wechsler Intelligence Scale for Children)

1. Vocabulary test
2. Block design test
3. Vocabulary and block design test qualifications

WRAT (Wide Range Achievement Test)

4. Reading test
5. Arithmetic test
6. WRAT test qualification
7. Harris-Goodenough draw a person test
8. Sex of person drawn by sex of youth
9. Draw a person test qualification
10. Literacy test - reading
11. Handedness by psychological examiner
12. Foreign language problem

Normalized T-Scores

13. Vocabulary test
14. Block design test
15. Reading test
16. Arithmetic test
17. Draw a person test

Indexes

18. Index of intellectual development (WISC)
19. Index of educational achievement (WRAT)

WISC Scaled Scores Based on HES Data

20. Vocabulary
21. Block design
22. Sum of vocabulary and block design
23. HES Scaled Scores full scale WISC I.Q. estimate

WISC Manual Scaled Scores

24. Vocabulary
25. Block design
26. Sum of WISC manual scaled score
27. Full scale WISC estimated I.Q.
28. Race Adjusted Socio-Intellectual Status (SIS) Index
29. Race Adjusted Differential Intellectual Development (DID) Index

I. DIAGNOSTIC IMPRESSIONS . . . .

1. Normal-abnormal
2. Cardiovascular system
3. Neurological conditions
4. Musco-skeletal
5. Other systems
6. Hand preference
7. Abnormal neurological findings
8. Other systems
9. Nutritional appraisal

J. BODY MEASUREMENT . . . .

1. Temperature of youth

Grip Strength

2. Right hand
3. Left hand
4. Handedness
5. Test satisfactory
6. Cervicale height
7. Acromal height
8. Radial height
9. Stylion height
10. Iliac chest height
11. Trochanter height
12. Tibial height
13. Sitting height
14. Sphyrion height
15. Foot breadth
16. Ankle breadth
17. Knee breadth
18. Elbow breadth
19. Wrist breadth
20. Calf skinfold

21. Standing height
22. Bizygomatic breadth
23. Bigonial breadth
24. Seat breadth
25. Foot length
26. Biacromial breadth
27. Bicristal breadth
28. Bitrochanteric breadth
29. Upper arm girth
30. Forearm girth
31. Chest girth
32. Waist girth
33. Hip girth
34. Calf girth
35. Triceps skinfold
36. Subscapular skinfold
37. Lateral chest wall skinfold
38. Supra-iliac skinfold
39. Weight
Thigh height
Elbow-elbow width

K. DENTAL EXAMINATION . . . .

1. Number of missing permanent teeth
2. Number of decayed permanent teeth
3. Number of filled permanent teeth
4. Total number of decayed, missing & filled permanent teeth
5. Number of decayed primary teeth
6. Number of filled primary teeth
7. Number of primary teeth needing extraction
8. Total number of primary teeth decayed, filled & needing extraction
9. Number of permanent teeth present
10. Number of primary teeth present
11. Number of permanent teeth erupted
12. Peridontal index
13. Presence of gingivitis and peridontal pockets
14. Simplified debris index
15. Simplified calculus index
16. Simplified oral hygiene index
17. Malocclusion syndrome
18. Examination qualifications
19. Treatment priority index
20. Buccal segment relation (right)
21. Buccal segment relation (left)

Posterior Crossbite

22. Number of upper teeth on right - to buccal
23. Number of upper teeth on right - to lingual
24. Number of upper teeth on left - to buccal

25. Number of upper teeth on left - to lingual
26. Incisor vertical relationship
27. Overjet
28. Mandibular protusion
29. Overbite
30. Openbite

Number of Malaligned Teeth (minor rotated)

31. Upper anterior
32. Upper posterior
33. Lower anterior
34. Lower posterior

Number of Malaligned Teeth (major rotated)

35. Upper anterior
36. Upper posterior
37. Lower anterior
38. Lower posterior
39. Orthodontic appliances

L. VISION . . . .

Wears glasses for Color Vision Test
Ishihara and H-R-R Tests
Ishihara Score
H-R-R Score
Color Vision Deficiency Severity--Red Green
Color Vision Deficiency Severity--Blue-Yellow
Trial Lens for Myopia - Right Eye
Trial Lens Test Score - Right Eye
Trial Lens for Myopia - Left Eye
Trial Lens for Test Score - Left Eye
Distance Lateral Phoria--Uncorrected
Near Lateral Phoria--Uncorrected
Distance Lateral Phoria--Corrected
Near Lateral Phoria--Corrected
Monocular Distance--Right Eye--Uncorrected
Monocular Distance--Left Eye--Uncorrected
Binocular Distance--Uncorrected
Monocular Near--Right Eye--Uncorrected
Monocular Near--Left Eye--Uncorrected
Binocular Near--Uncorrected
Monocular Distance Vision--Right Eye--Corrected
Monocular Distance Vision--Left Eye--Corrected
Binocular Distance Vision--Corrected

Lensometer Readings--Right Eye

Sign First Reading
First Reading
Sign Second Reading
Second Reading

Axes Reading
Power of Lens Sign
Power of Lens
Spherical Equivalence of Lens Sign
Power

Lensometer Readings--Left Eye
Sign First Reading
First Reading
Sign Second Reading
Second Reading
Axes Reading
Power of Lens Sign
Power of Lens
Spherical Equivalence of Lens Sign
Power
Trial Lens Test for Myopia--Right Eye
Trial Lens Test Score--Right Eye
Trial Lens Test for Myopia--Left Eye
Trial Lens Test Score--Left Eye

Landolt Ring Tests
Distance without correction--Right Eye
Distance without correction--Left Eye
Distance without correction--Binocular
Distance with correction--Right Eye
Distance with correction--Left Eye
Distance with correction--Binocular
Trial Lens Evaluation or Trial Lens Test for Myopia, without correction--Right Eye
Trial Lens Test Score--Right Eye
Trial Lens Evaluation or Trial Lens Test for Myopia, without correction--Left Eye
Trial Lens Test Score--Left Eye
Near, with correction--Right Eye
Near, with correction--Left Eye
Near, with correction--Binocular
Trial Lens Test for Myopia, with correction--Right Eye
Trial Lens Test Score--Right Eye
Trial Lens Test for Myopia, with correction--Left Eye
Trial Lens Test Score--Left Eye

M. EAR, NOSE AND THROAT EXAMINATION . . . .

External Ear--Right
External Ear--Left
Auditory Canal--Right
Auditory Canal--Left
Occluded Right Ear
Occluded Left Ear

Preceding page blank

Occluded By.--Right
Occluded By.--Left
Drum--Right
Drum--Left
Dull, Transparent--Right
Dull, Transparent--Left
Bulging, Retracted--Right
Bulging, Retracted--Left
Calcium Plaques--Right
Calcium Plaques--Left
Coloration--Right
Coloration--Left
Fluid--Right
Fluid--Left
Perforated--Right
Perforated--Left
Scars--Right
Scars--Left
Other Findings--Right
Other Findings--Left
Drum Mobile--Right
Drum Mobile--Left
Tonsils
Oral Pharynx
Nares--Right
Nares--Left
Obstruction--Right
Obstruction--Left
Other Findings--Right
Other Findings--Left
Physician's Number

N. AUDIOMETRY--HEARING . . . .

Decibel Levels at 4000 CPS--Right Ear
Decibel Levels at 4000 CPS--Left Ear
Decibel Levels at 1000 CPS--Right Ear
Decibel Levels at 1000 CPS--Left Ear
Decibel Levels at 6000 CPS--Right Ear
Decibel Levels at 6000 CPS--Left Ear
Decibel Levels at 500 CPS--Right Ear
Decibel Levels at 500 CPS--Left Ear
Decibel Levels at 2000 CPS--Right Ear
Decibel Levels at 2000 CPS--Left Ear
Decibel Levels at 250 CPS--Right Ear
Decibel Levels at 250 CPS--Left Ear
Decibel Levels at 4000 CPS--Right Ear
Decibel Levels at 4000 CPS--Left Ear
Decibel Levels at 8000 CPS--Right Ear
Decibel Levels at 8000 CPS--Left Ear

Decibel Levels at 3000 CPS--Right Ear
Decibel Levels at 3000 CPS--Left Ear
Conditions Affecting Test Results

O. PHYSICIAN'S EXAM . . . .

Eyes

Lids, Conjunctivae and Sclerae--Right
Lids, Conjunctivae and Sclerae--Left
Pupil and Irides--Right
Pupil and Irides--Left
Tropia--Right
Tropia--Left
Extraocular Muscles and Conjugate Gaze--Right
Extraocular Muscles and Conjugate Gaze--Left
Other Eye Abnormalities

Breast Examination--Males

Right
Left
Gynecomastia--Right
Gynecomastia--Left
Other Findings

Breast Examination--Females

Maturation Stage--Right
Maturation Stage--Left
Other Breast Findings
Findings--Right
Findings--Left

Heart

Point of Maximal Impulse (P.M.I.) Interspace
Midclavicular Line
Thrills
Systolic--Diastolic
Base--Apex
Heart Sounds--First
Heart Sounds--Second
Murmur Present
Significance of Murmur
Other Murmurs
Other Cardias or Cardiovascular Findings
Abdominal Examination
Abdominal Examination Findings
Herniarpaphy--Inguinal
Other Abdominal Findings

Genitalia Examination

Pubic Hair Maturation
Genital Maturation Grade--Males

Circumcision--Males
Other Genital Findings--Males
Findings--Males
Musculoskeletal Findings
Skin--Facial Acne Grade
Other Skin Findings

P. BLOOD PRESSURE . . . .

Systolic (1) Supine--Beginning of Physician's Exam
Diastolic (1) Supine--Beginning of Physician's Exam
Systolic (2) Supine--End of Physician's Exam
Diastolic (2) Supine--End of Physician's Exam
Systolic (3) Sitting--End of Physician's Exam
Diastolic (3) Sitting--End of Physician's Exam
Systolic (1) Supine--Beginning of Physician's Exam (includes imputed data)
Diastolic (1) Supine--Beginning of Physician's Exam (includes imputed data)
Systolic (2) Supine--Beginning of Physician's Exam (includes imputed data)
Diastolic (2) Supine--Beginning of Physician's Exam (includes imputed data)
Systolic (3) Sitting--Beginning of Physician's Exam (includes imputed data)
Diastolic (3) Sitting--Beginning of Physician's Exam (includes imputed data)
Nurse's Number

Q. NURSE'S QUESTIONNAIRE--FEMALES . . . .

Monthly Periods started
Been told about periods
Source of information about periods
Told about periods before they started
Source of first information about periods
Preferred source of information
Age when periods started
Number of days since last period
Length of periods
Number of days between periods
Pain or discomfort from periods
Frequency of discomfort
Severity of discomfort
Medicine for pain
Sick room or nurse
Miss school or work
Talked to doctor about pain or discomfort
Number of pads per day of period

R. BONE AGE . . . .

- Reader Number
- Film Quality
- Distal Radius
- Distal Ulna
- Capitate
- Hamate
- Triquetral
- Lunate
- Scaphoid
- Trapezium
- Trapezoid
- Metacarpal I
- Metacarpal II
- Metacarpal III
- Metacarpal IV
- Metacarpal V
- Pisiform
- Adductor Sesamoid
- Flexor Sesamoid
- Proximal Phalanx I
- Proximal Phalanx II
- Proximal Phalanx III
- Proximal Phalanx IV
- Proximal Phalanx V
- Middle Phalanx I
- Middle Phalanx II
- Middle Phalanx III
- Middle Phalanx IV
- Middle Phalanx V
- Distal Phalanx I
- Distal Phalanx II
- Distal Phalanx III
- Distal Phalanx IV
- Distal Phalanx V
- Individual Differences
- Average Bone Age

S. BLOOD TESTING . . . .

- Uric Acid
- Imputation Status
- Cholesterol
- Imputation Status
- Blood Type
- Hematocrit
- Protein Bound Iodine (PBI)
- PBI Qualifications

Red Blood Cells (RBC) Antigens

ABO (A line)
Rh-D (D line)
Rh-C (C line)
Rh-E (E line)
Rh Code (e line)
ABH Secretor Ability (Se line)

Plasma Proteins

Haptoglobin (Hp line)
Transferrins (Tr line)
Group Specific Component Type (Gc line)
Alpha and Beta Types

Syphilis Screening

BDRL Results
FTA/ABS Results

APPENDIX II

Defining Birth Orders and Siblings in H.E.S.

The Sampling design of the Health Examination Surveys Cycle II and III was such that frequently more than one child from a household fell into the sample. Although there was no direct way in the public release form of the data to identify children in the same household, examination of these data led me to believe identification could be accomplished with reasonable accuracy with a procedure whereby invariant characteristics of a household, such as ages of parents, income, and household size were compared and matches sought. This procedure was enhanced by the fact that NCHS evidently had left the records of the children from the same household next to one another. (We had already determined that twins had been left next to each other on the data tapes. The twin matching, not only examined invariant household characteristics, but also compared day, month and year of birth, so we are extremely confident of their identification.) Thus, in identifying children in the same household we required they be next to one another on the data tape and that they match on at least 32 of 34 characteristics in Cycle II and 26 of 28 in Cycle III. (We allowed for one coding error.) In addition, we required that the age order in the household be consistent among members living in the same household. Thus, we are highly confident that the respondents identified as residing in the same household did indeed so reside, and fairly confident that those we have identified as not living in the same household as others in the sample did not do so. It must be kept in mind, however, that there is no certainty in this procedure.

Given that we have identified respondents in the same household several analytic refinements can be made. For example, siblings can be identified where two or more children reside with their natural parent or in certain cases, where they reside with one natural parent (per Levin and Briggs' memo on family composition), keeping in mind that all children being in a household are not necessarily siblings. Once siblings have been identified, we are in a position, for example, to estimate age mother started her fertility for all siblings providing the first born child is in the sample. Other possible refinements could include effects of child-spacing, and birth order comparisons.

In regard to examining birth order effects among siblings, a certain technical problem was uncovered in the data. The variable birth order was defined from fields in the birth certificate information--the number of children currently living and the number of children born alive who are now dead. Adding one to the sum of these fields yields a direct estimate of birth order. When using the data as a cross-sectional sample,* this is rather straight forward. However, when comparing siblings, we discovered that in some instances two or more siblings had the same computed birth order. Examination of these cases suggested that in some instances coding errors had been made in the birth certificate records--generally a failure to record a dead child in one of the sibling's records. In other cases, the siblings turned out to be twins whose birth certificates were identically coded in the fields comprising the birth order definition. In a few cases, a missing value code was given in the number of dead children field.*

After considering the matter, we decided to adopt the following procedure for birth order comparisons.

1. Consider a missing value in the number of children born alive now dead field to be equivalent to a zero (inspection of several cases where younger siblings were present suggests this to be a reasonable assumption).

2. Discard all cases where a pair of siblings have an equal birth order.

3. Discard all pairs of twins from birth order effects analysis. (Twins will be analyzed separately. We suggest discarding them because they muddy the analysis of birth order effects.)**

The number of cases affected is quite small. For example, there were only 61 such cases in Cycle III including those with missing values in the number of dead children field. One must bear in mind, however, that not all errors in birth order will be filtered by this technique. For example, consider a household with three siblings in the sample with computed birth orders 1, 1, and 3. The comparison of the first child with the third and the comparison of the second child with the third will both appear as 1-3 comparisons. There will, of course, be very few such comparisons and, generally they will at least be ordinally correct.

---

*In processing cases, one cannot assume that the children and youth are in any particular order within the household.

**In processing the data, we cannot assume that all sets of twins will have identical birth orders. Dates of birth must be compared among twins for positive identification.

APPENDIX III

Table A--Background Information by Criterion Variable (Only, Eldest, Middle, Youngest and Non-Only) for Children Ages 6-11: Cycle II (N=7119)

	Only	Eldest	Middle	Youngest	Non-Only
	Personal and Demographic Characteristics of Examined Child				
Percent having both parents	73	88	85	87	86
Percent living in urbanized area	65	54	53	55	54
Mean income	$6841	$7110	$6234	$7449	$6764*
Median income	$6347	$6435	$5635	$6674	$6080
Median # of years in school of fathers	11.2	11.4	10.8	11.2	11.1
Percent of fathers with >4 years college education	5.7	8.1	4.6	7.2	6.1
Median # of years in school of mothers	11.3	11.3	10.8	11.2	11.1
Percent of mothers with >4 years college education	3.2	1.8	.8	1.5	1.2
Percent fathers working full-time	90.3	95.1	89.8	92.6	91.9
Percent mothers working full-time	41.6	25.9	25.5	35.5	28.4
Percent married once	75	85	78	80	80

*Last interval for income assumed $15,000-$20,000.

	Only	Eldest	Middle	Youngest	Non-Only
Percent married more than once	7	9	12	10	11
Percent divorced, widowed, etc.	17	6	9	10	9
Median household size	2.3	4.9	6.7	4.7	5.7
Mean Household size	2.8	5.2	7.1	5.0	6.1**
Percapita income	$2443	$1367	$878	$1490	$1109
	Birth Certificate Information				
Percent of women being mothers less than 20	15	40	11	3	15
Percent of infants 7+ lbs. at birth	52	64	66	66	66
Median birth weight	7.1	7.3	7.5	7.5	7.4
	Medical History				
Percent of mothers stayed over 1 week in hospital	12	8	5	10	7
Percent of babies stayed 1 week or more in hospital	16	11	9	13	11
Percent of babies with something wrong at birth	12	8	7	8	8
Percent of mothers having medical problems during pregnancy	16	13	12	14	13
Percent of babies in good health at 1 year	91	93	90	90	91
Percent of babies breastfed	27	39	35	26	33
Percent of babies walked under 1 year	55	54	45	48	48

**Midpoint for first interval for household size assumed to edual 2.5; last interval assumed to equal 7-10.

	Only	Eldest	Middle	Youngest	Non-Only
Percent of children with very good health	57	57	50	52	52
Percent of babies with talking problems	4	5	10	8	8
Percent of children restricted from hard exercise	10	6	5	6	5
Percent went to dentist last year	72	67	53	67	60
	Intellectual Growth and Development				
Percent of babies who spoke first word under 1 year	54	56	42	46	46
Percent of children learning faster than others	31	29	15	20	20
Percent attended Kindergarten or nursery school	71	75	66	72	69
Percent who repeated grades	18	9	17	11	14
Percent of academic failure	7	5	9	6	7
Percent of children judged above average on intellectual ability	32	29	20	29	25
Percent of children judged above average on academic performance	25	27	19	27	23
Percent of children with IQs less than 80	3	5	12	5	8
Percent of children with IQs greater than 110	42	34	22	31	26

	Only	Eldest	Middle	Youngest	Non-Only
Median IQ	105.8	102.7	97.9	102.6	100.3
Percent frequently slept overnight with friends	11	11	7	10	9
Percent of children afraid of darkness	23	22	24	27	24
Percent of children who ate 2+ meals with others yesterday	68	83	82	75	80
Percent who eats too much	7	13	10	9	11
Percent very fussy about food	11	6	7	9	7
Percent usually eat 2+ meals with family	81	96	96	92	95
Percent without any family duty or job	22	18	21	25	21
Percent without any pet	31	43	44	32	40
Percent who take care of pet	55	55	48	52	51
Percent with only a few friends	36	38	39	36	38
Percent have friends older than self	11	9	6	9	8
Percent have friends of same age	79	83	88	83	85
Percent who make friends easily	54	42	41	48	43
Percent no difficulty getting along with other children	44	43	45	51	46
Percent who ran away from home	1	2	2	2	2

	Only	Eldest	Middle	Youngest	Non-Only
Percent who are calm and relaxed	48	43	58	58	55
Percent not active with childrens' groups like boy scouts	53	49	60	55	56
Percent who do not spend time away from home	71	77	78	77	78
Percent who watch TV 2+ hours per day	46	48	48	48	48
Percent who listen to radio 1+ hours per day	17	12	11	10	11
Percent who do not read comics, newspapers	58	58	63	61	61
Percent who read books 1+ hours per day	26	28	20	20	22
Percent who spend 2+ hours with friends	65	59	59	61	59
Percent who play by themselves for at least 1 hour	54	26	23	39	28
Percent who spend some time doing chores	79	84	81	76	80
Percent no trouble getting child to bed	68	76	80	77	78
Percent no trouble getting child to sleep	90	85	88	90	78
Percent with some adjustment problem	18	16	17	16	17
Percent average attention span	58	58	58	58	58

	Only	Eldest	Middle	Youngest	Non-Only
Percent restless classroom movement	29	24	25	24	24
Percent aggressive measured by fighting	6	6	7	5	6
Percent of children disciplined frequently	12	7	7	8	7
Percent of children chosen when choosing sides among 1st	33	26	26	32	28
Percent of children chosen frequently as leader	13	14	12	15	13
	Physical Examination and Body Measurement				
Percent of children with systolic blood pressure 100-114	59	60	64	61	62
Percent of children with diastolic blood pressure 60-74	67	66	66	65	66
Percent of children with normal health according to physician	90	88	87	89	88
Median height (cm)	132.6	133.7	131.1	130.9	131.65
Mean height (cm)	136.2	137.5	134.3	134.6	130.2
Median weight (kg)	28.4	28.6	27.1	27.8	27.7
Mean weight (kg)	31.2	31.5	29.3	30.4	30.3
Median age of father at birth of child	30.6	24.9	29.9	34.1	29.9
Median age of mother at birth of child	27.9	21.4	26.8	31.3	26.7
N 6551	190	1468	3169	1724	6361

Table B--Background Information by Criterion Variable (Only, Eldest, Middle, Youngest and Non-Only) for Youths Ages 12-17: Cycle III (N=6768)

	Only	Eldest	Middle	Youngest	Non-Only
	Personal and Demographic Characteristics of Examined Youth				
Percent having both parents	73	84	79	18	81
Percent living in urbanized area	69	54	50	55	53
Mean income	$8401	$8955	$7732	$8912	$8319*
Median income	$7697	$8375	$7111	$8270	$7720
Median # of years in school of fathers	11.3	11.3	10.6	11.2	11.1
Percent of fathers with >4 years college education	4.9	7.6	5.5	6.7	6.4
Median # of years in school of mothers	11.4	11.3	10.7	11.2	11.1
Percent of mothers with >4 years college education	3.1	2.1	1.2	2.1	1.7
Percent fathers working full-time	92.3	95.5	90.8	93.5	92.7
Percent mothers working full-time	34.1	15.6	13.7	23.2	18.7
Percent married once	69	80	74	74	75
Percent married more than once	9	11	13	11	12
Percent divorced, widowed, etc.	22	9	13	15	13

*Last interval for income assumed $15,000-$20,000.

	Only	Eldest	Middle	Youngest	Non-Only
Median household size	2.6	5.1	6.3	3.9	5.4
Mean household size	2.8	5.6	6.7	3.9	5.8**
Percapita income	$3000	$1599	$1154	$2285	$1434
	Birth Certificate Information				
Percent of women being mothers less than 20	11	38	11	3	16
Percent of infants 7+ lbs. at birth	71	66	74	71	71
Median birth weight	7.3	7.2	7.5	7.4	7.4
	Medical History				
Percent of mothers having problems during pregnancy or delivery	14	14	8	12	11
Percent of youths in hospital overnight or longer	63	56	46	51	50
Percent of youths restricted from hard exercise	14	13	10	12	11
Percent went to doctor last year	58	62	47	57	53
Percent treated by doctor last year	58	54	40	50	46
Percent went to dentist last year	77	67	55	69	61
Percent treated by dentist last year	63	59	48	60	53
Percent overweight	20	12	11	15	12

**Midpoint for first interval for household size assumed to equal 2.5; last interval assumed to equal 7-10.

	Only	Eldest	Middle	Youngest	Non-Only
Percent had teeth straightened	21	14	6	13	10
Percent no straightening but needs it	15	12	11	12	12
Percent wet bed past year	2	4	6	3	5
Percent ever been to a psychiatrist	11	7	5	6	6
	Intellectual Growth and Development				
Percent of youths described as too fast in mental development	4	1	1	0	1
Percent attended kindergarten	76	73	61	69	66
Percent attended nursery school	25	12	6	12	9
Percent age 5 or less when started school	32	22	17	22	19
Percent reacted upset when started school	6	3	3	3	3
Percent of youths judged above average on intellectual ability	38	32	23	32	27
Percent of youths judged in upper third on academic performance	33	31	23	31	27
Percent of youths with IQs less than 80	4	5	12	6	9
Percent of youths with IQs greater than 110	42	34	21	30	27
Percent of youths with WRATS less than 80	6	6	13	7	10

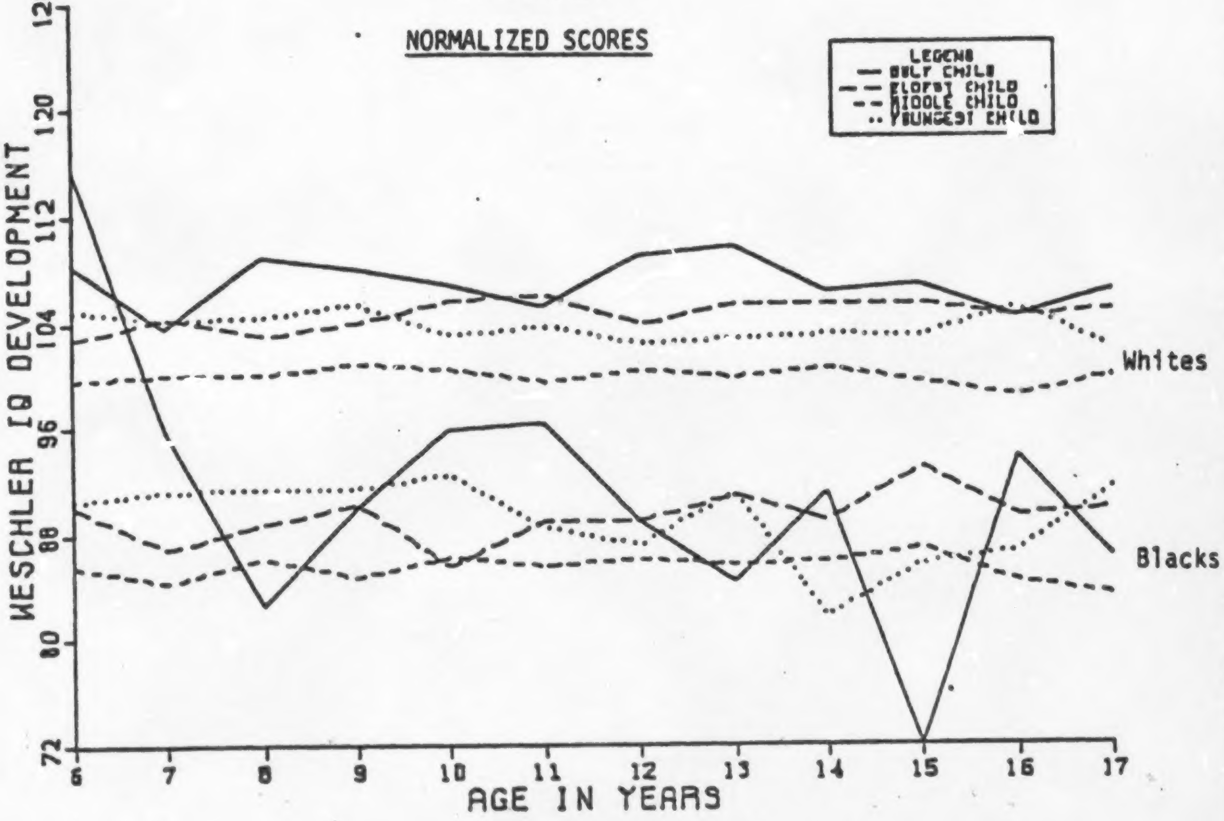
	Only	Eldest	Middle	Youngest	Non-Only
Percent of youths with WRATS greater than 110	35	33	21	31	26
Median IQ	105.7	102.9	97.4	101.6	99.92
	Social and Psychological Variables				
Percent never stay overnight with friends	19	15	22	15	19
Percent who sleep alone in own room	88	51	32	72	46
Percent eats too much	18	12	12	12	12
Percent very fussy about food	10	7	7	8	7
Percent usually eating 2+ meals with family	61	62	60	60	61
Percent never feels tense, fidgety, nervous	19	19	24	18	21
Percent of youths who describe self as somewhat or very nervous	62	56	45	51	49
Percent have little/lot trouble making friends	21	22	15	17	17
Percent some or more trouble to bring up	34	41	41	36	40
Percent no trouble to bring up	66	59	59	63	60
Percent of parents who know most of youth's friends	82	80	74	81	77
Percent who earn money from work	24	32	38	29	34

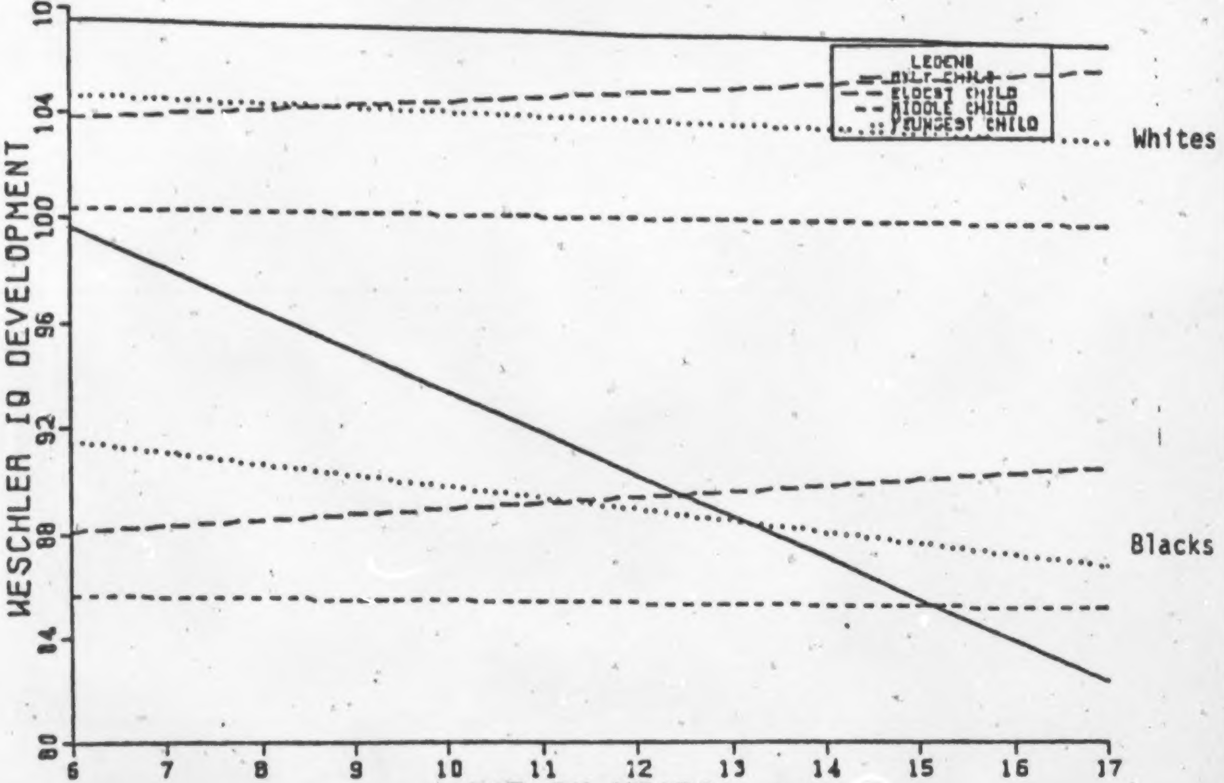
	Only	Eldest	Middle	Youngest	Non-Only
Percent who listen to radio 1+ hours per day	62	68	61	61	60
Percent who watch TV 2+ hours per day	75	64	73	74	71
Percent who do not read newspapers, comics, etc.	10	10	16	12	14
Percent who read books 1+ hours per day	57	58	50	51	53
Percent who have no trouble getting to sleep	55	46	53	49	50
Percent who repeated grades	14	12	20	13	17
Percent who have some adjustment problem	19	14	19	14	17
	Physical Examination and Body Measurement				
Percent of youths with systolic blood pressure 110-129	43	51	53	51	52
Percent of youths with diastolic blood pressure 60-79	43	53	57	54	55
Percent of youths described in normal health by physician	73	79	78	78	66
Median height (cm)	165.0	163.6	161.9	163.6	162.8
Mean height (cm)	165.1	163.9	161.9	163.6	163.4
Median weight (kg)	57.6	55.8	52.7	54.9	54.0
Mean weight (kg)	56.5	54.6	52.5	54.3	53.8
Median age of father at birth of child	32.7	25.4	29.7	34.5	29.6

	Only	Eldest	Middle	Youngest	Non-Only
Median age of mother at birth of child	25.5	21.9	26.8	31.4	26.6
N 5910	198	1516	2920	1276	5712

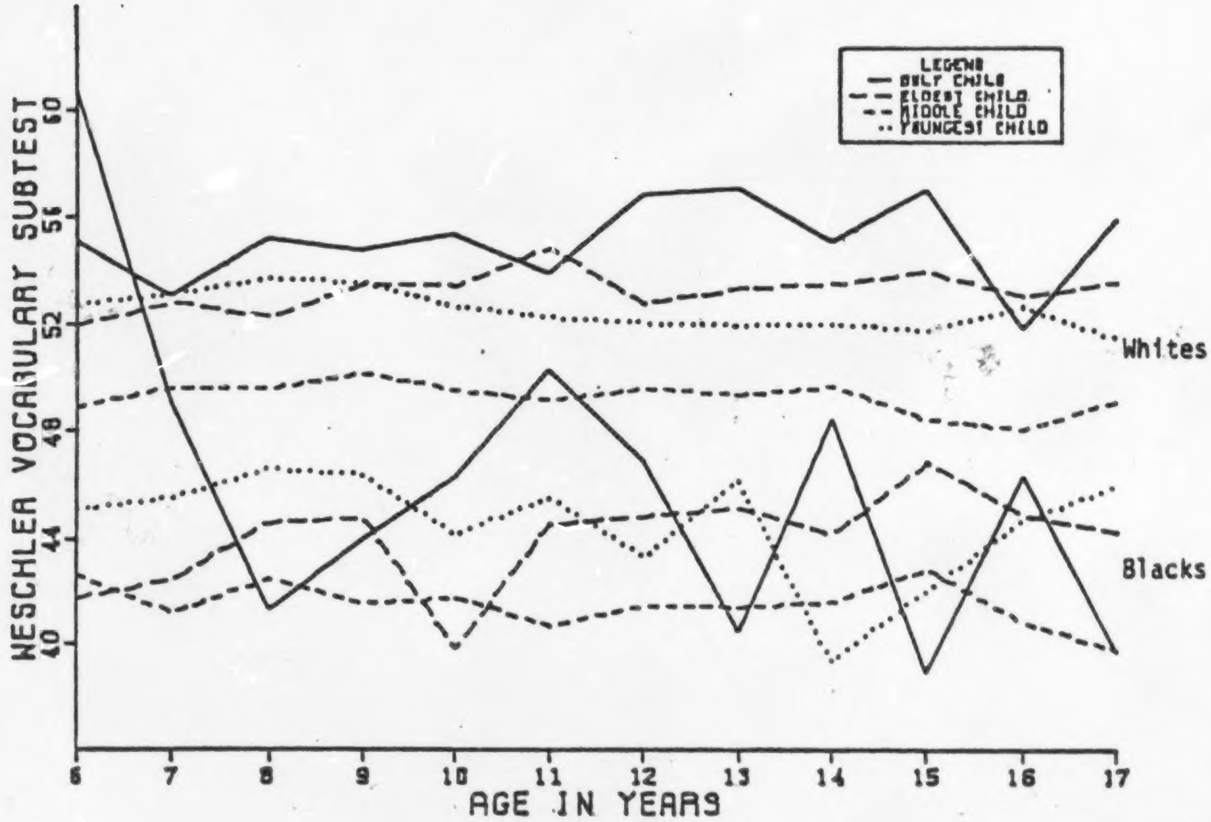
APPENDIX IV

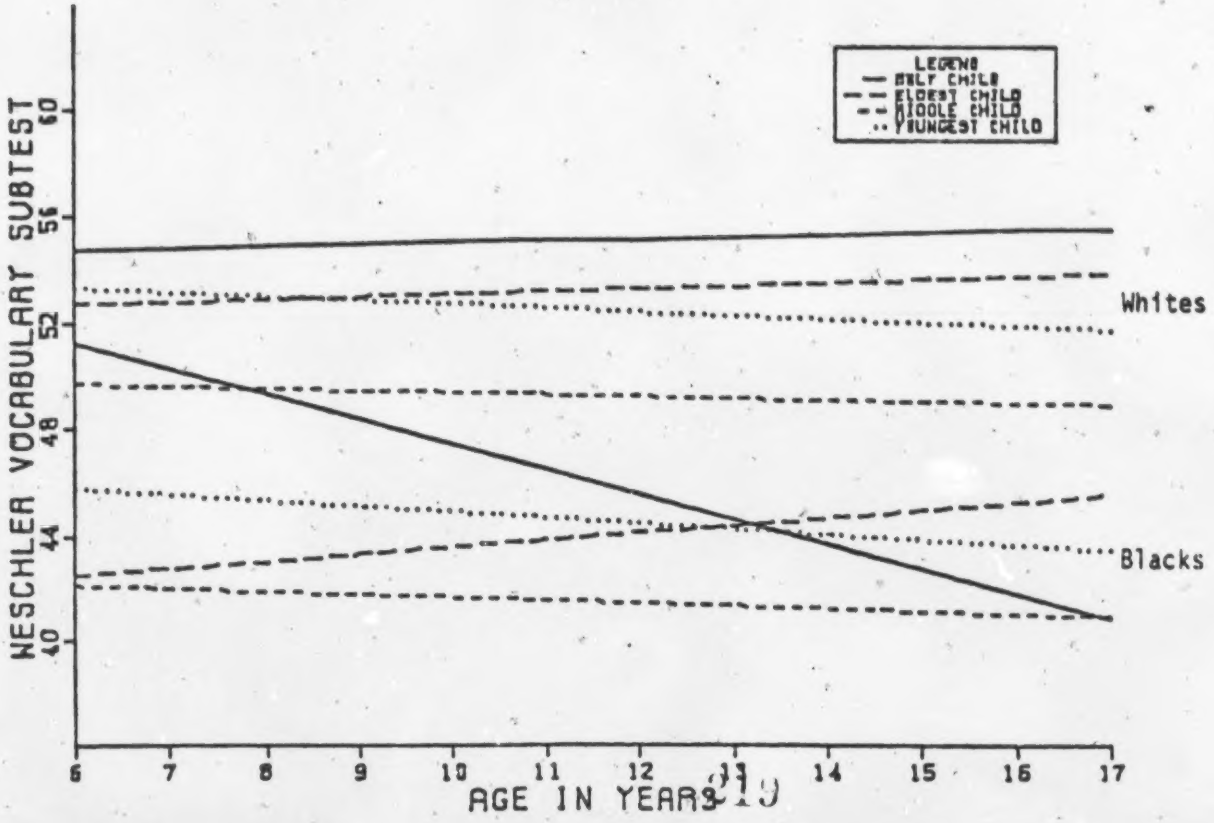
NORMALIZED SCORES



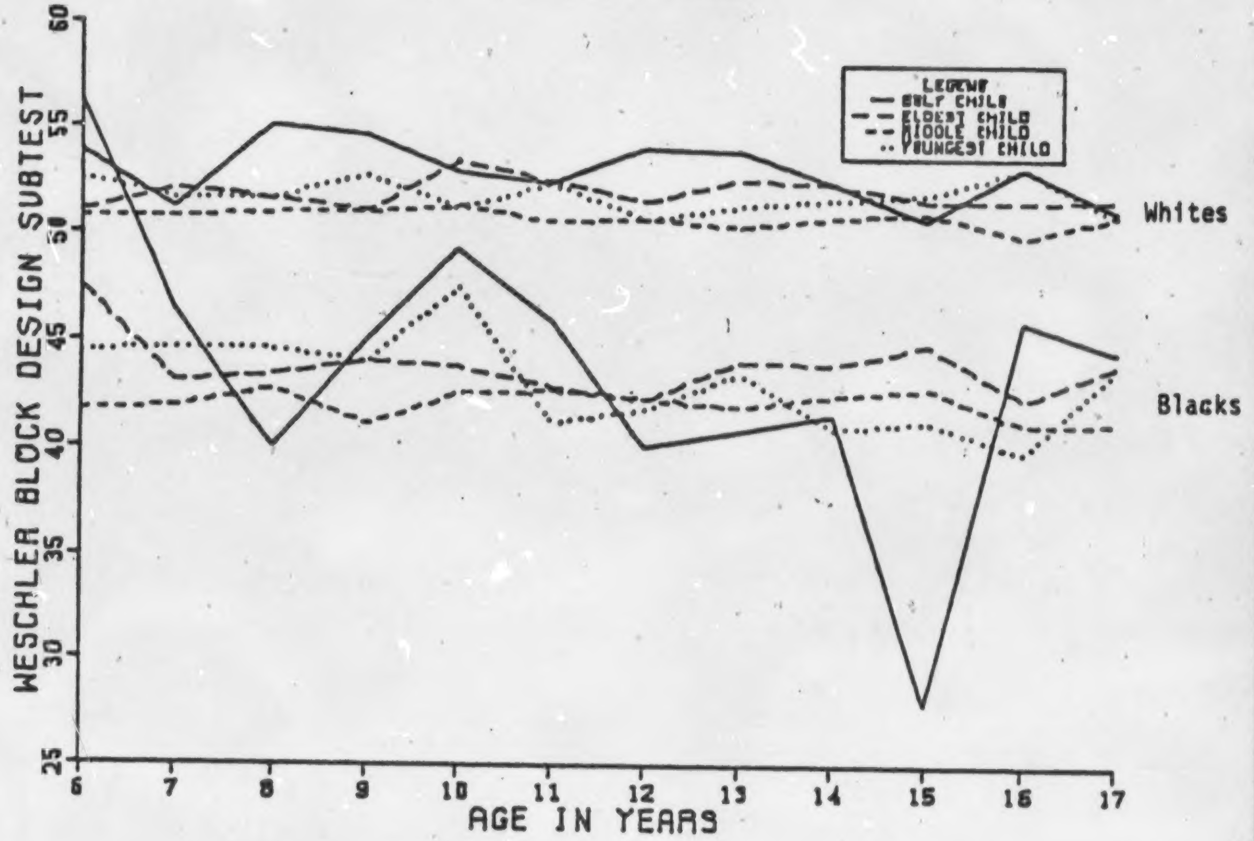


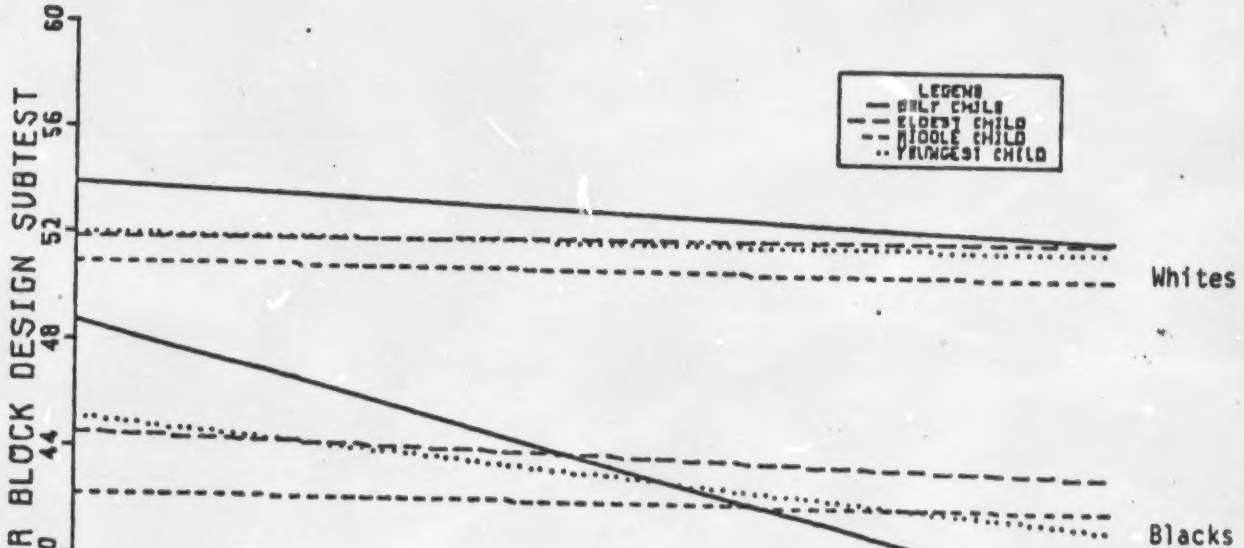
NORMALIZED SCORES

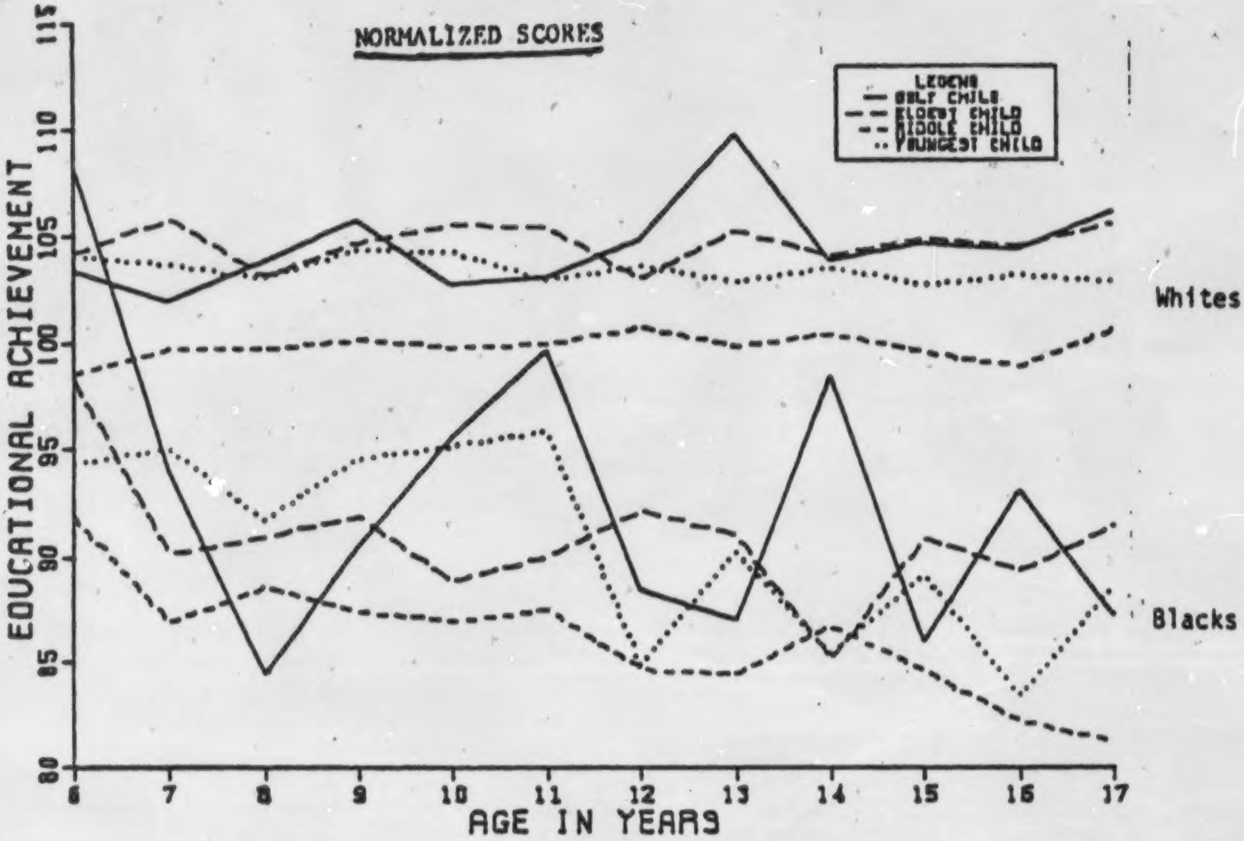


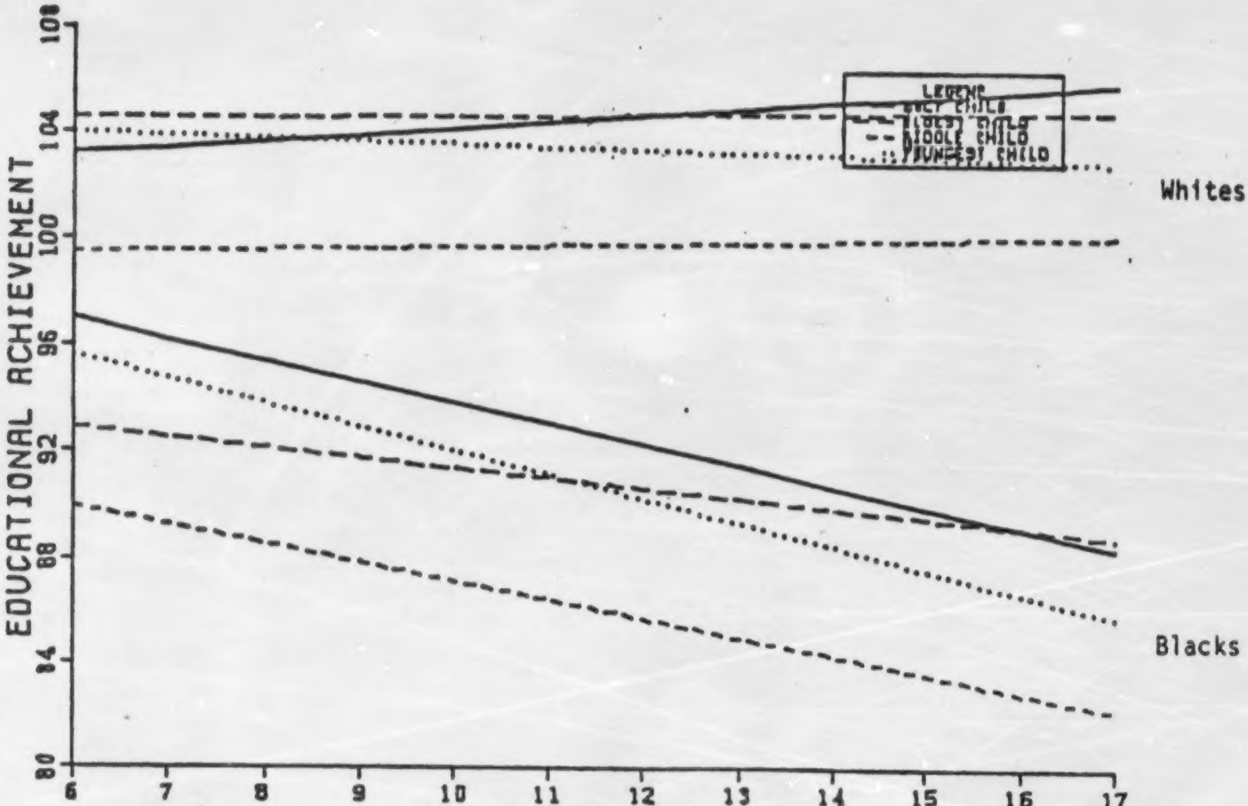


NORMALIZED SCORES'

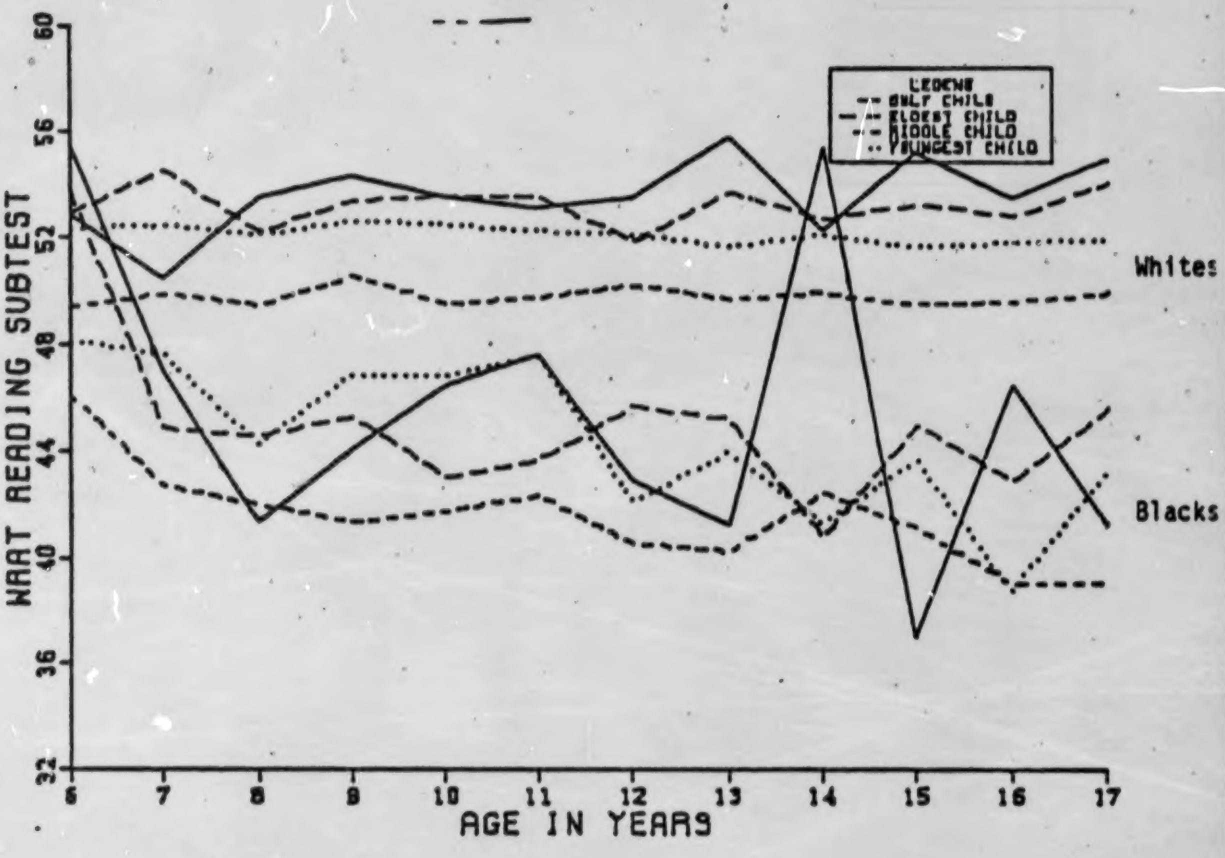


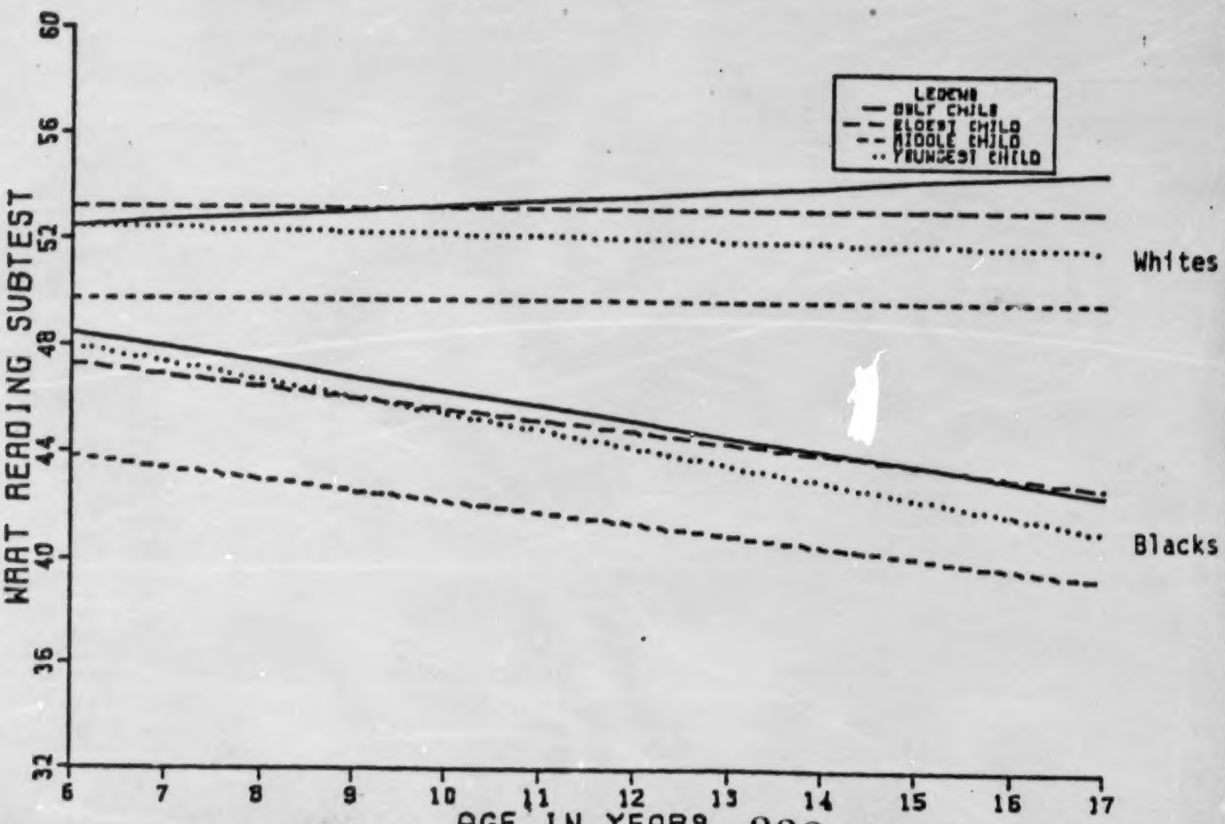



NORMALIZED SCORES
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD
EDUCATIONAL ACHIEVEMENT
80
85
90
95
100
105
110
115
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
Whites
Blacks

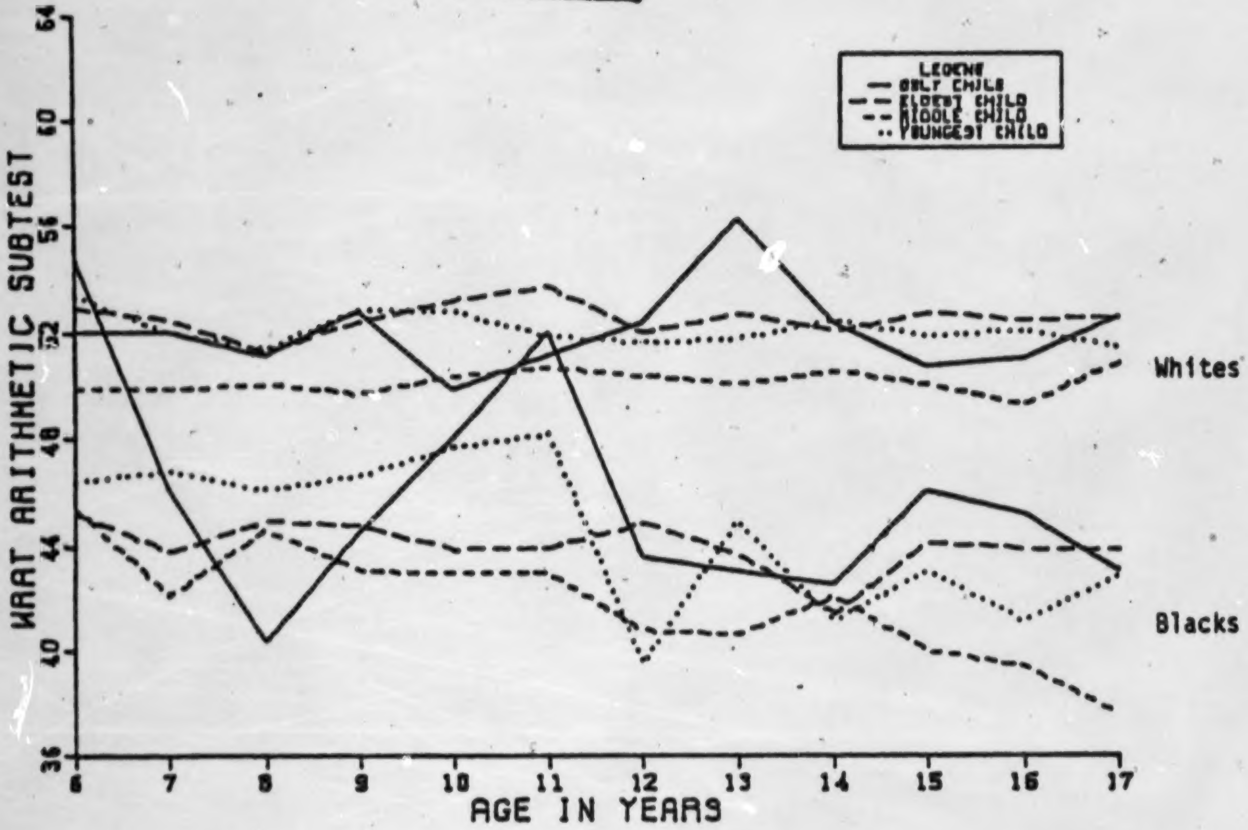

LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD
EDUCATIONAL ACHIEVEMENT
80
84
88
92
96
100
104
108
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
Whites
Blacks

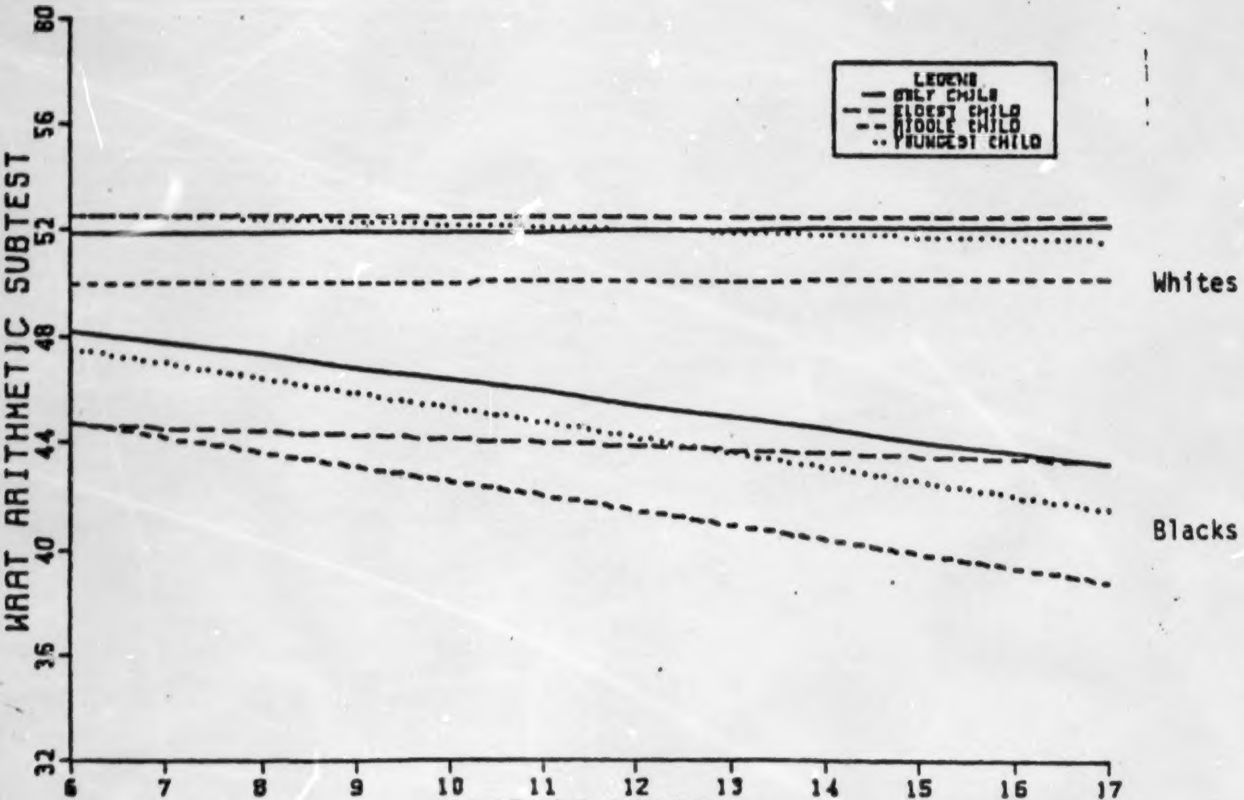
NORMALIZED SCORES

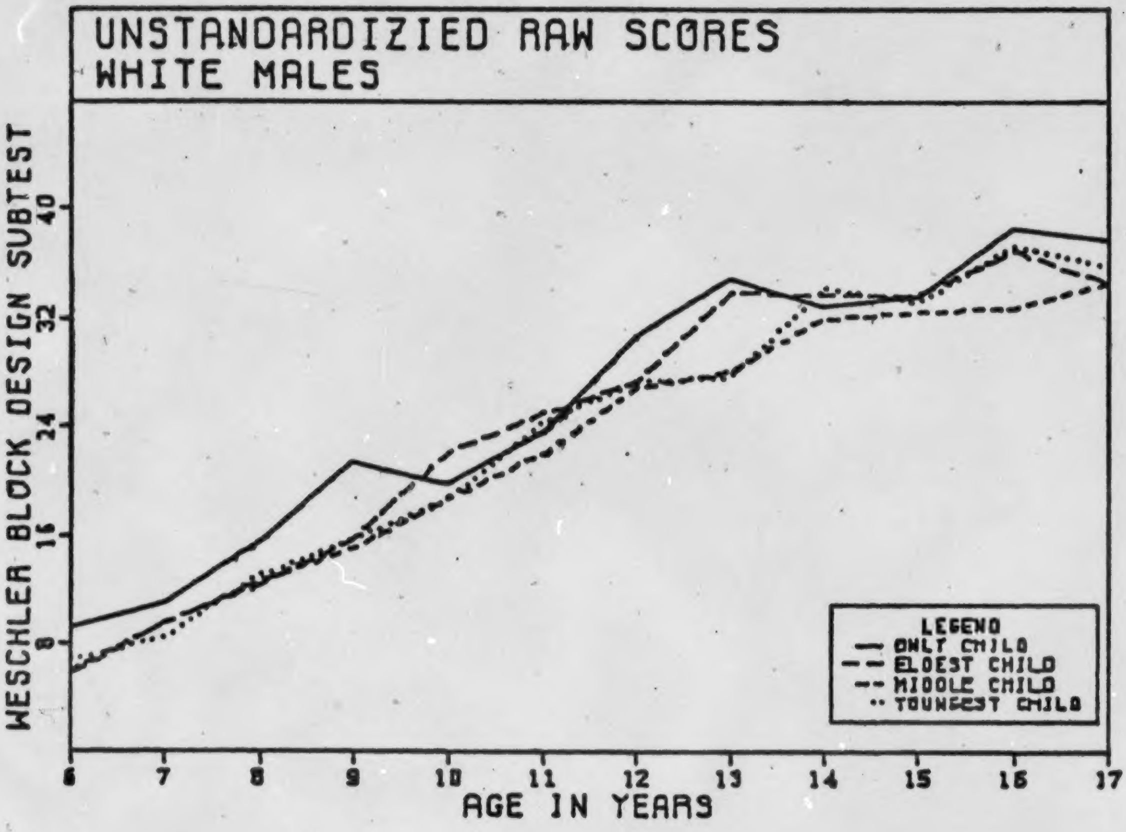


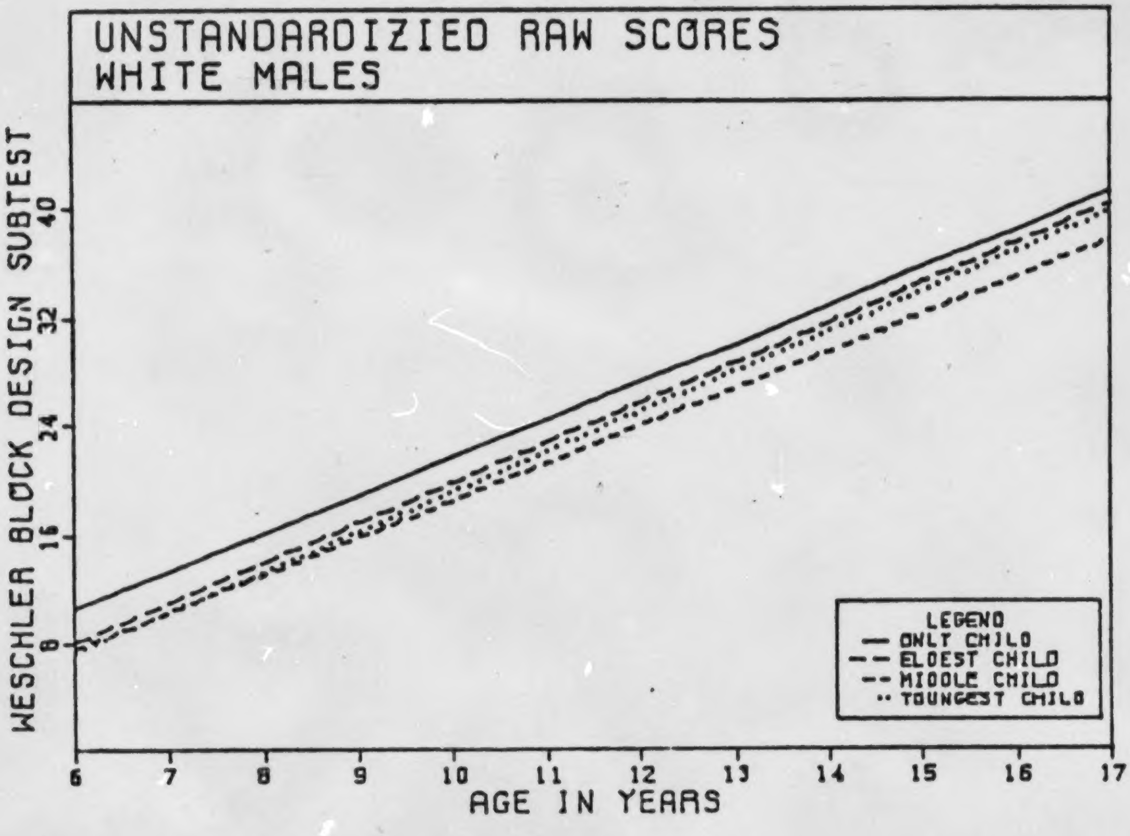


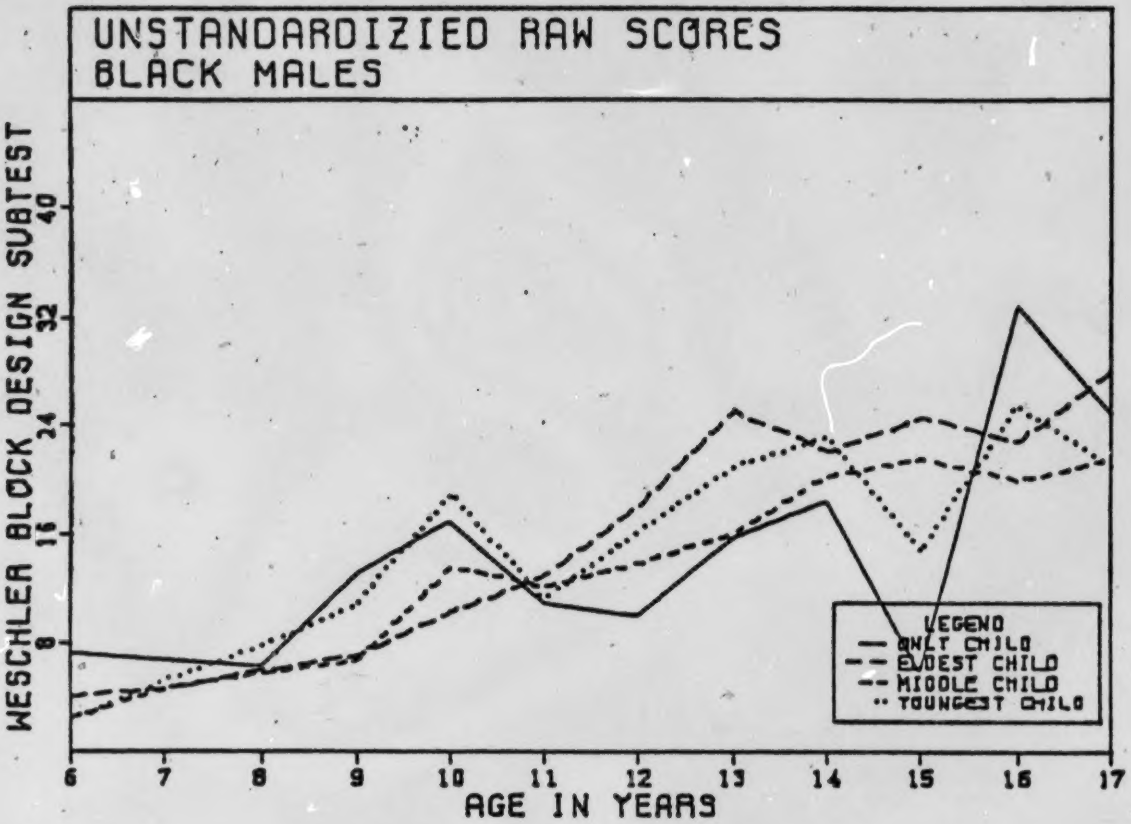
NORMALIZED SCORES

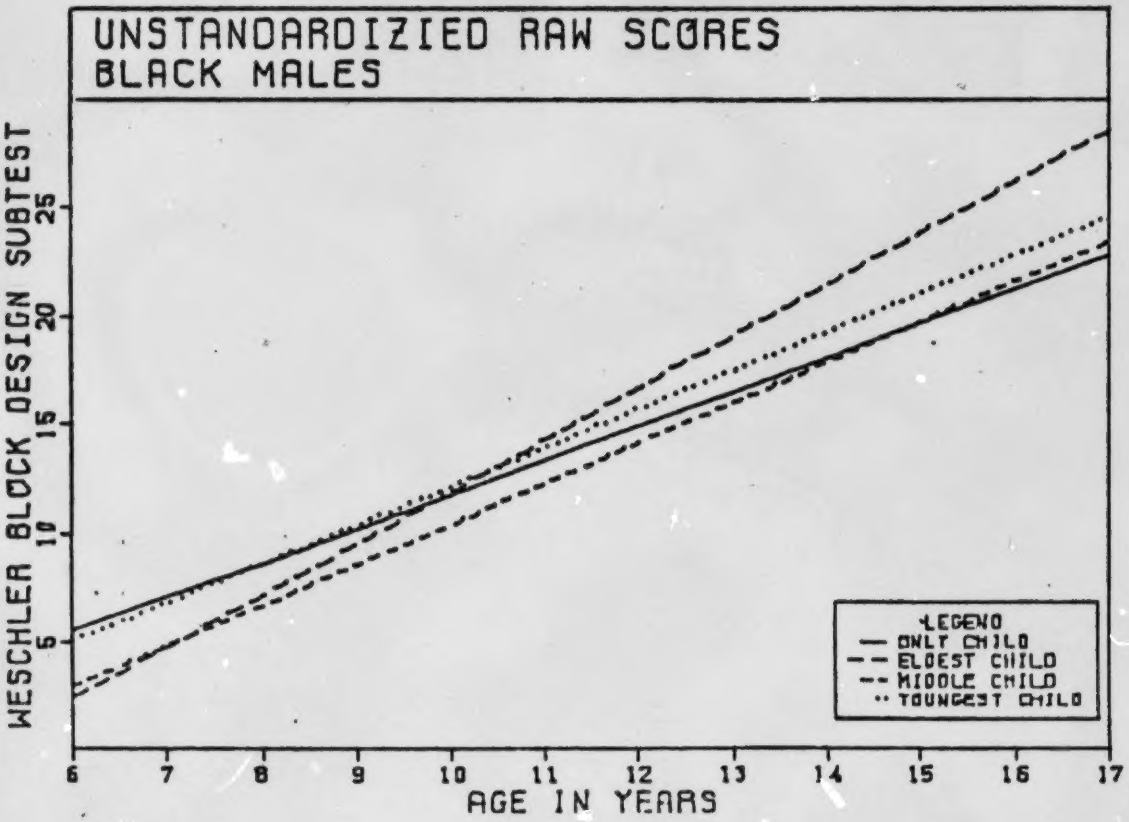


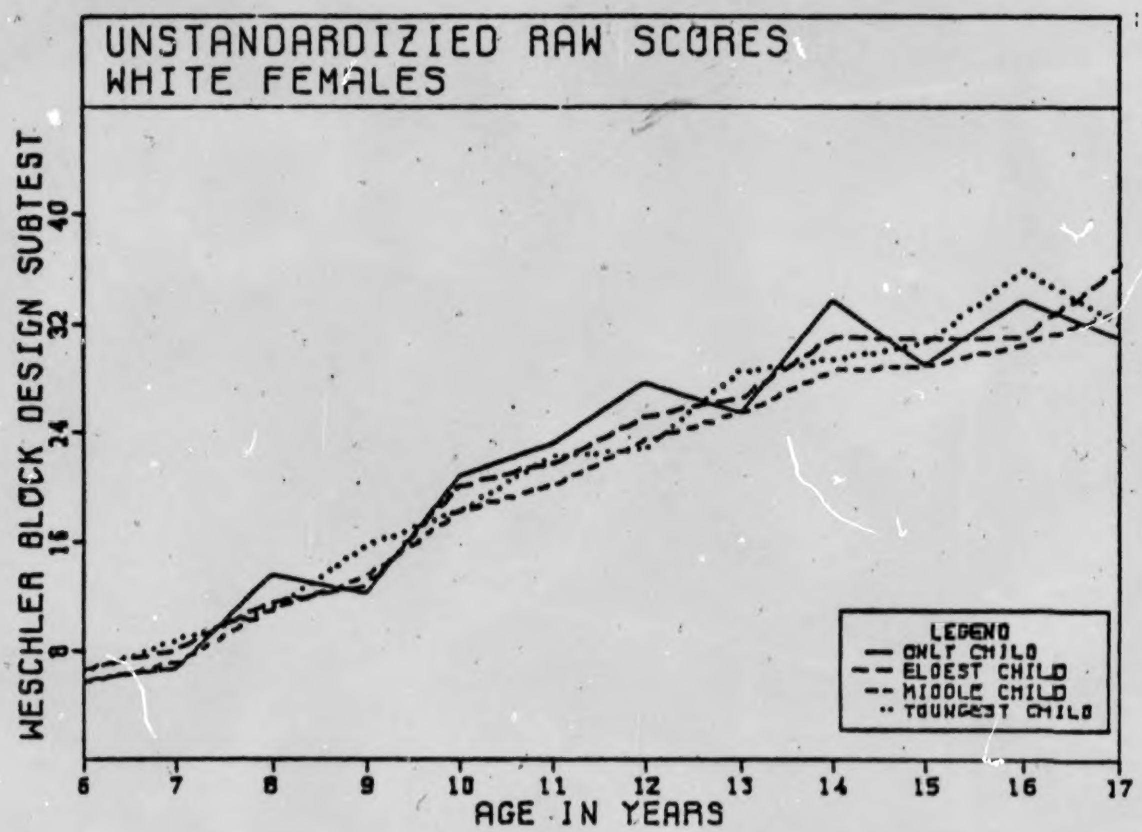


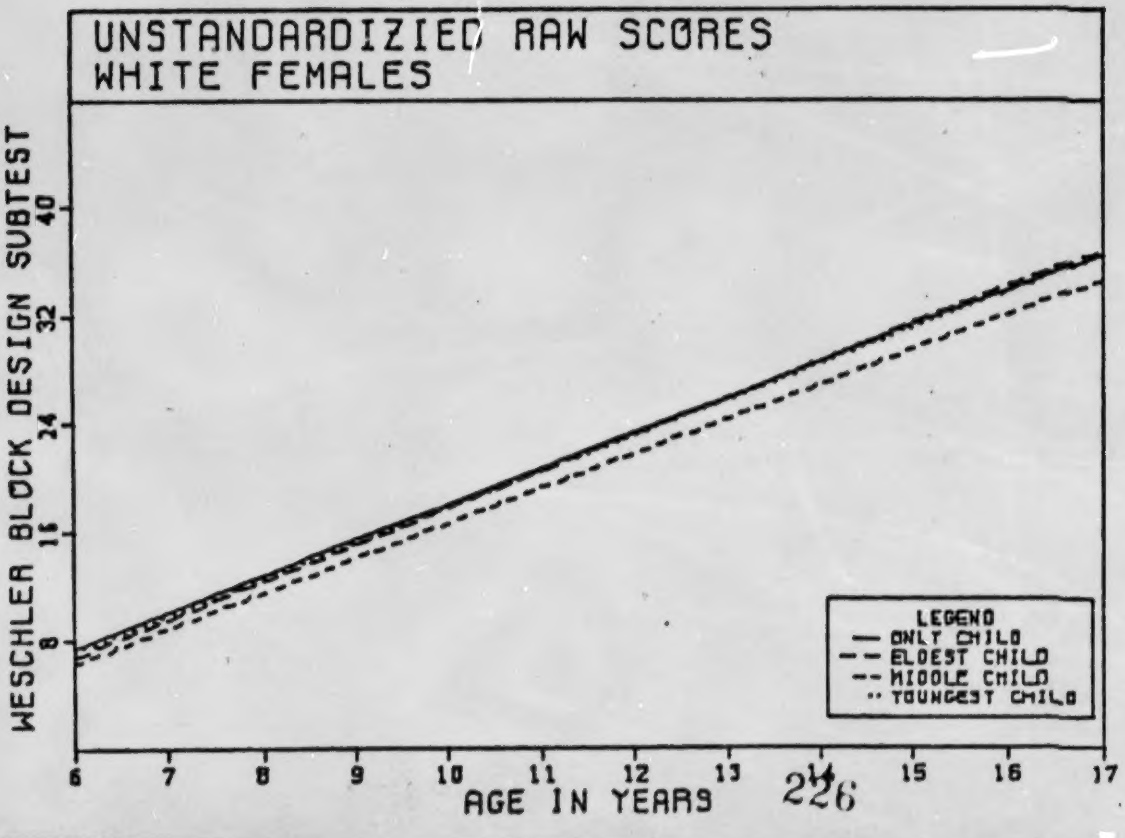

UNSTANDARDIZIED RAW SCORES
WHITE MALES
WESCHLER BLOCK DESIGN SUBTEST
8
16
24
32
40
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

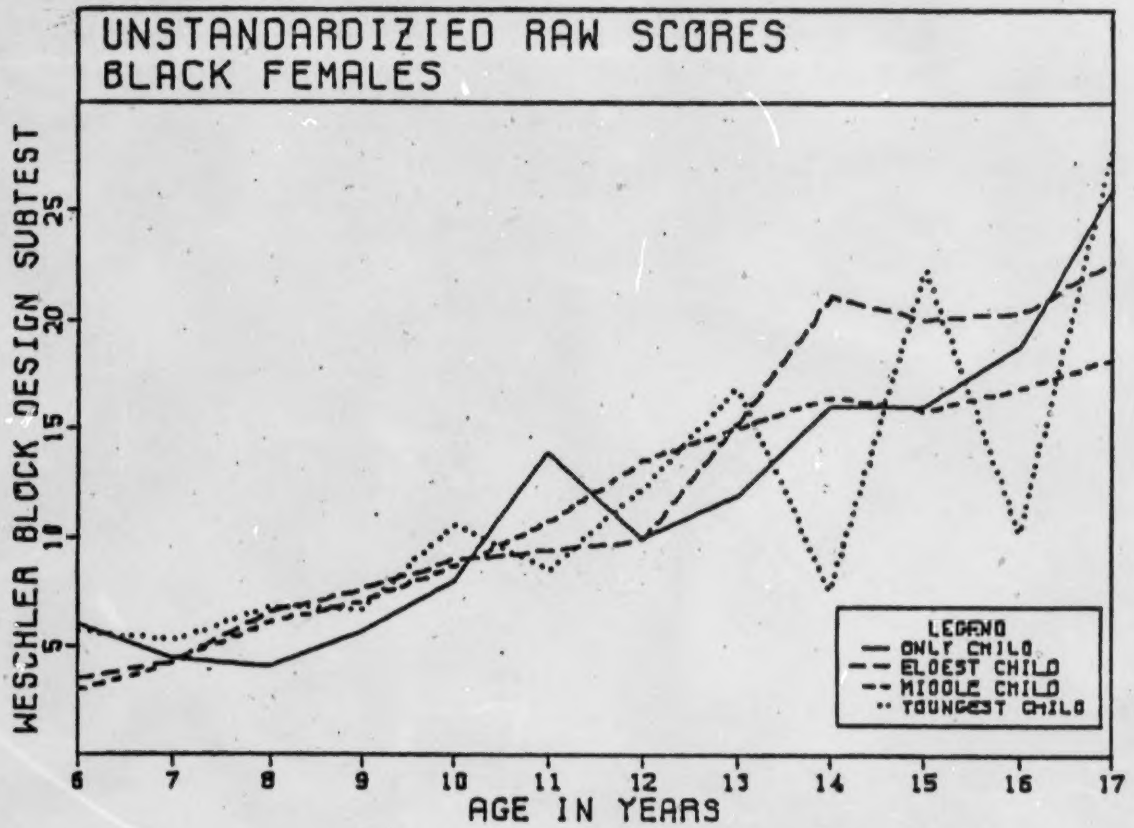

UNSTANDARDIZIED RAW SCORES
WHITE MALES
WESCHLER BLOCK DESIGN SUBTEST
8
16
24
32
40
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

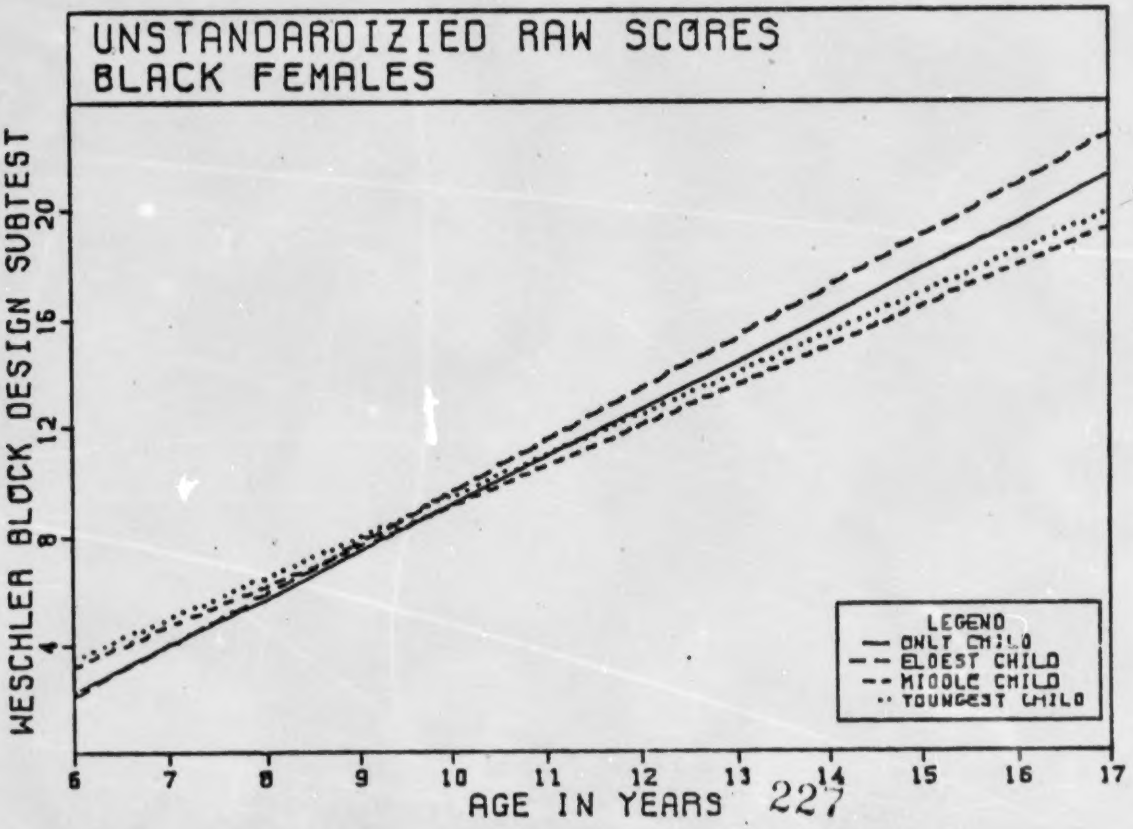

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WESCHLER BLOCK DESIGN SUBTEST
8
16
24
32
40
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

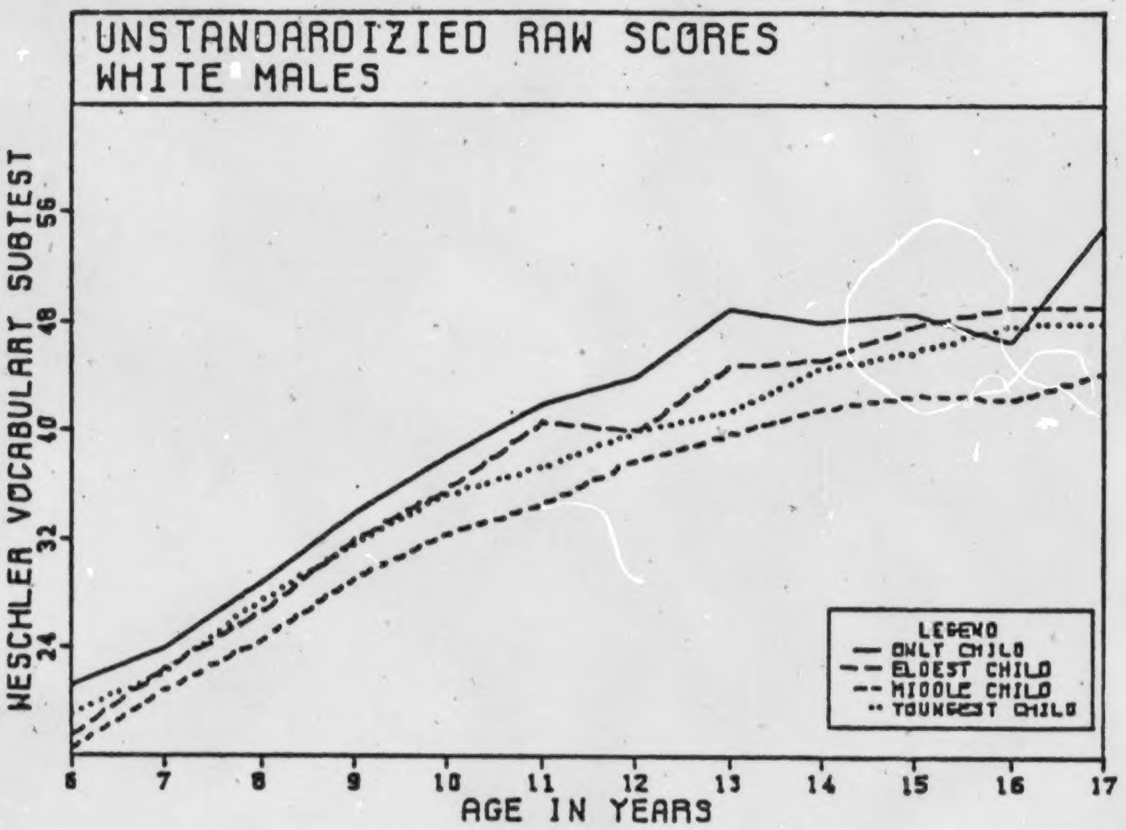

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WESCHLER BLOCK DESIGN SUBTEST
5
10
15
20
25
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

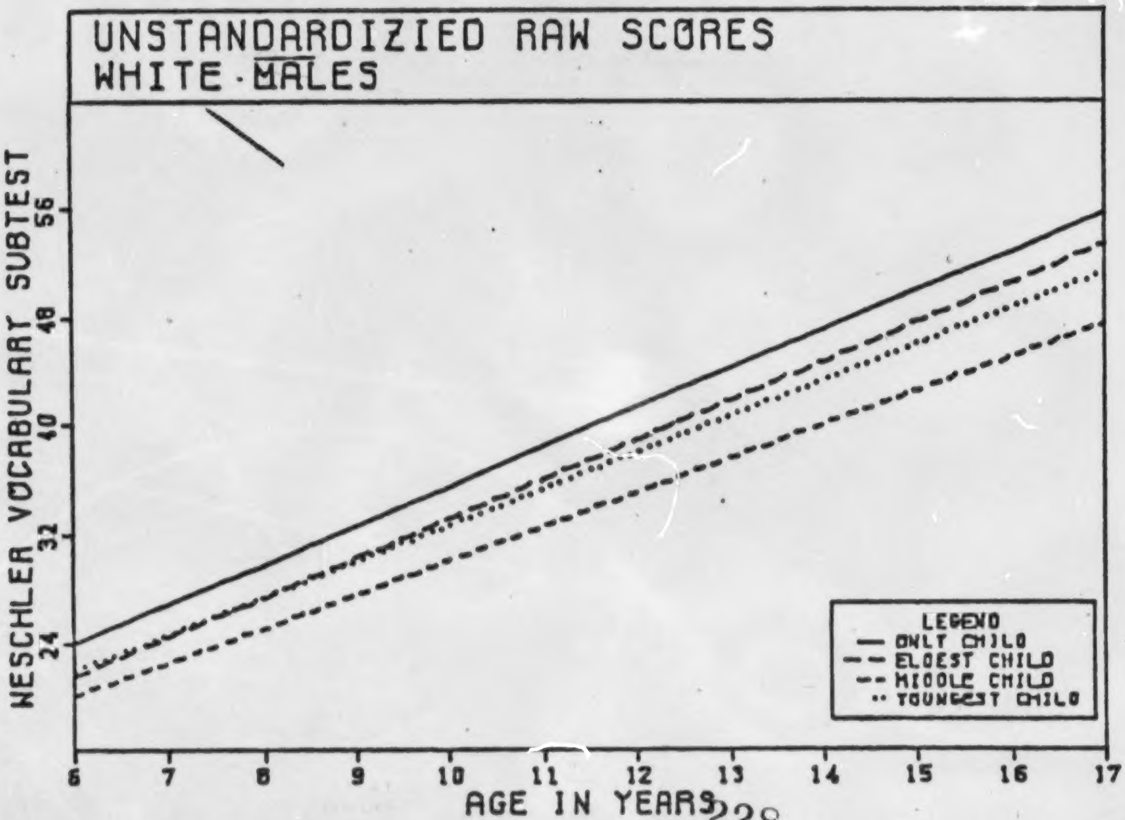

UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WESCHLER BLOCK DESIGN SUBTEST
8
16
24
32
40
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

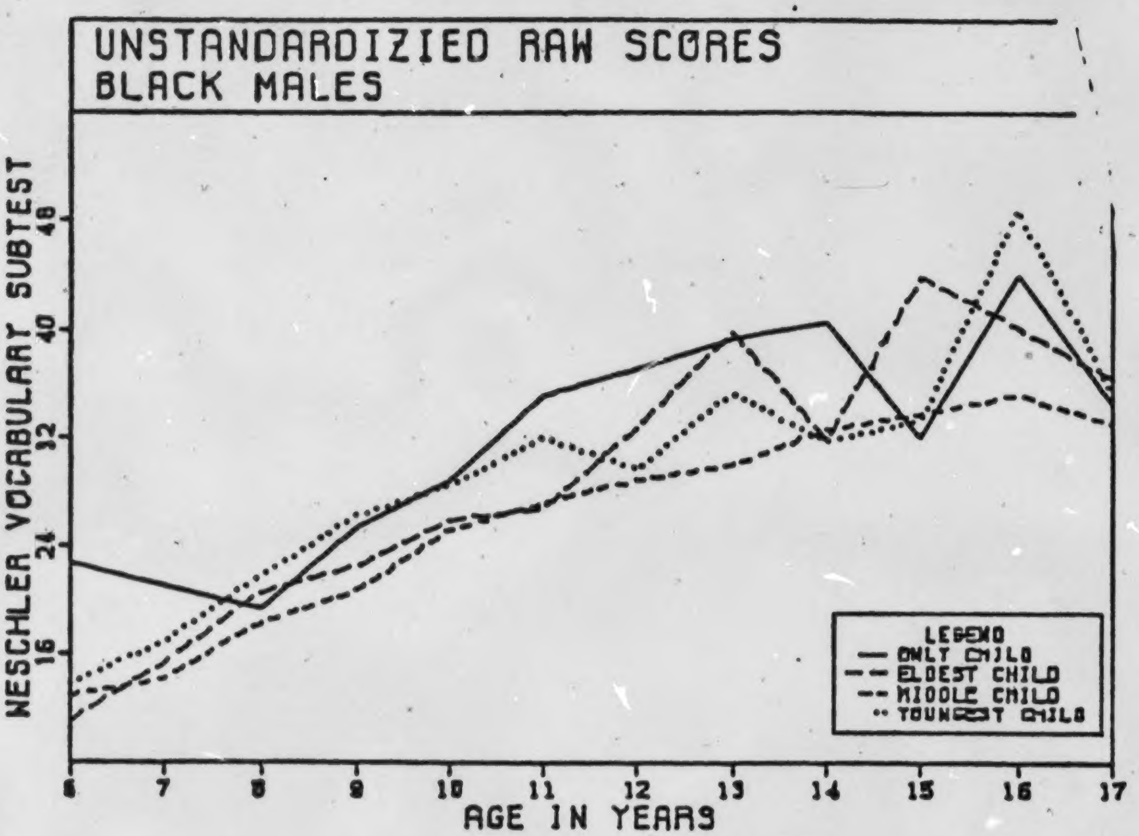

UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WESCHLER BLOCK DESIGN SUBTEST
8
16
24
32
40
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

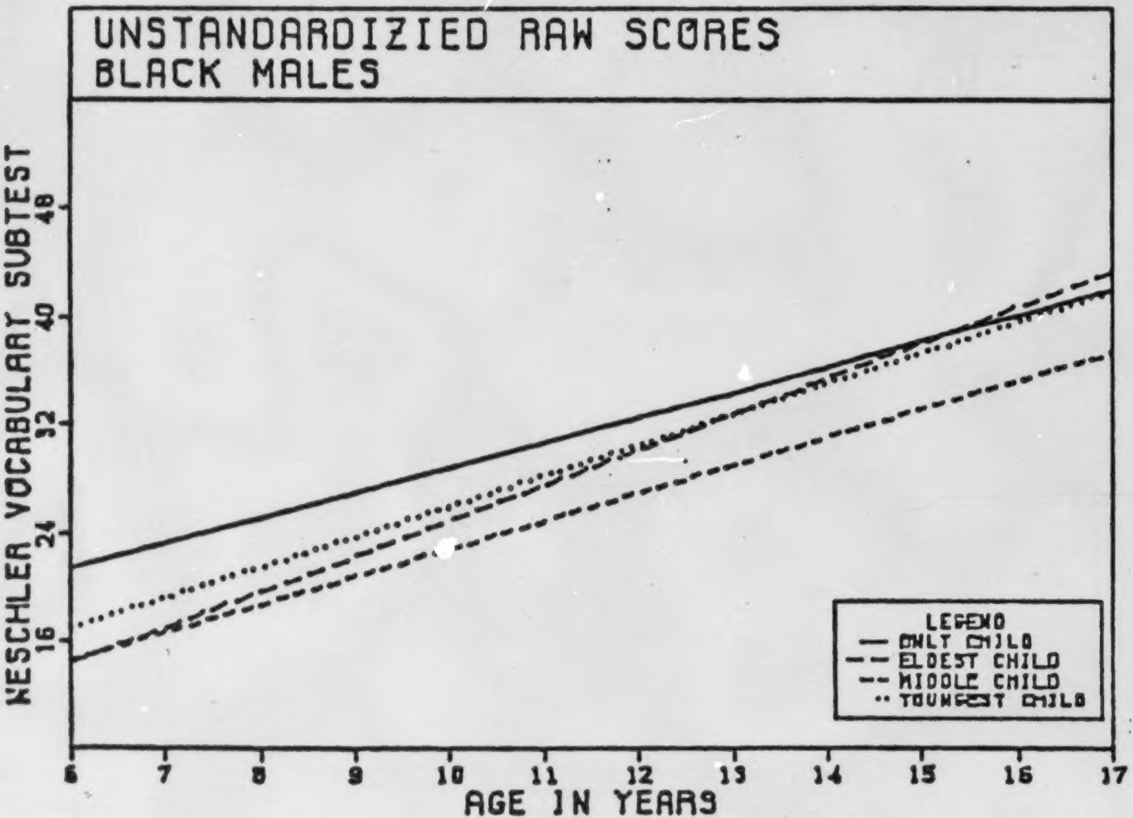

UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WESCHLER BLOCK DESIGN SUBTEST
5
10
15
20
25
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

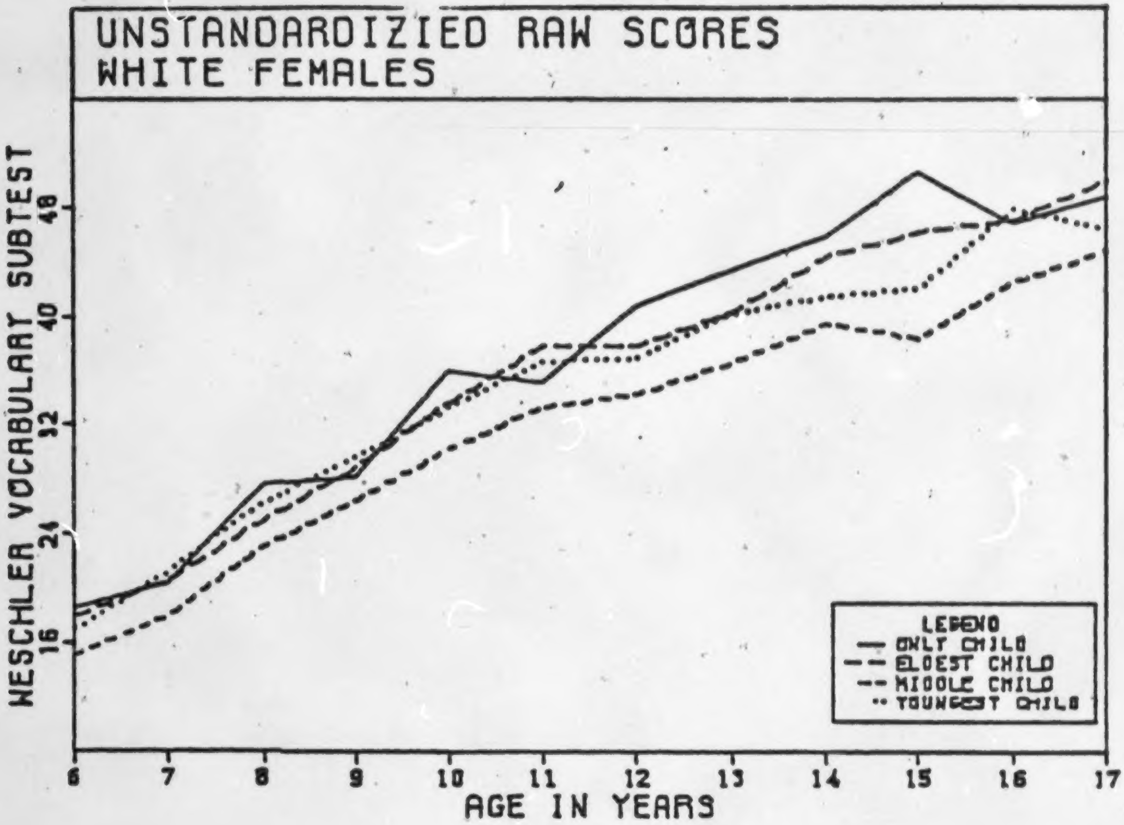

UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WESCHLER BLOCK DESIGN SUBTEST
4
8
12
16
20
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

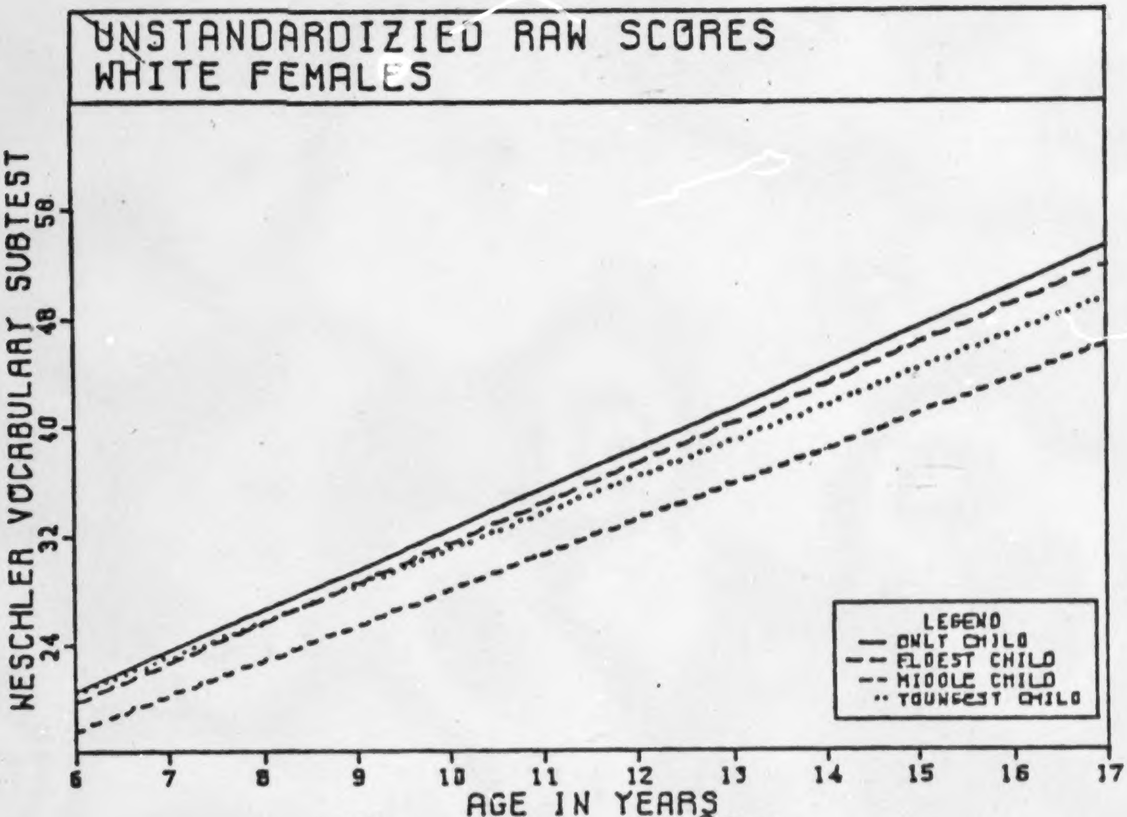

UNSTANDARDIZIED RAW SCORES
WHITE MALES
WESCHLER VOCABULARY SUBTEST
24
32
40
48
56
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

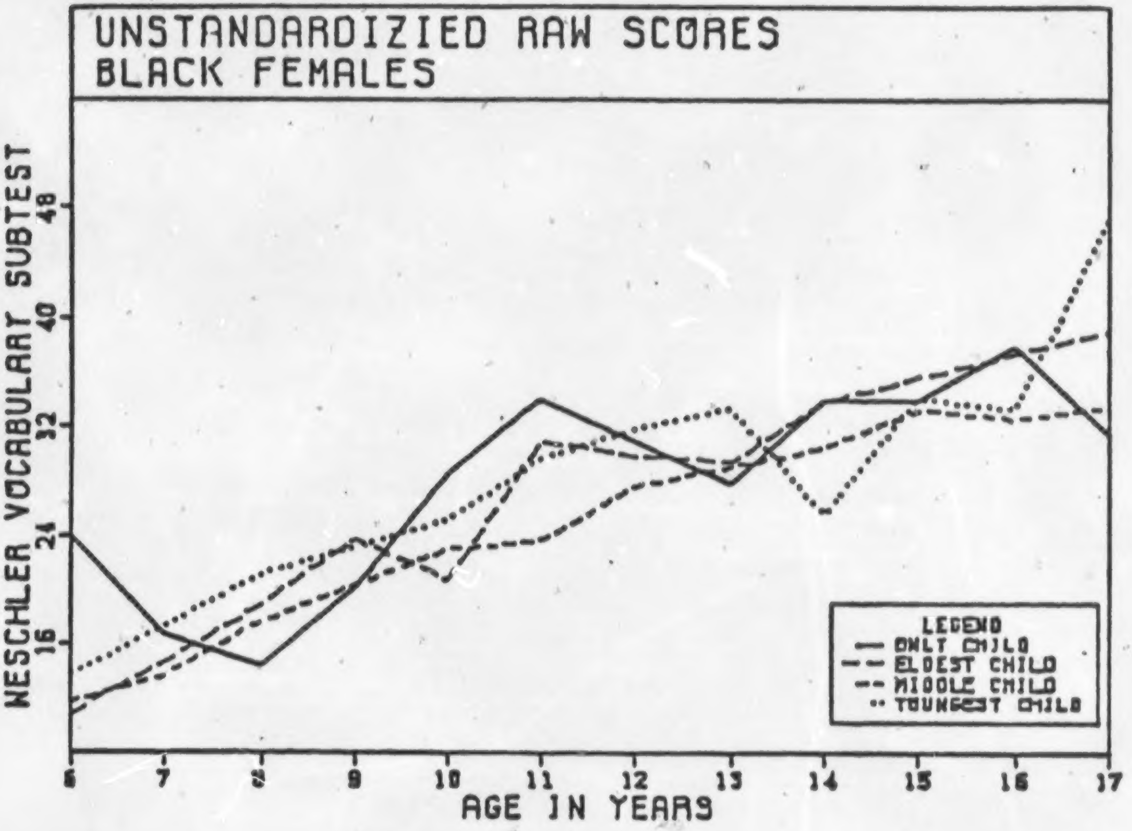

UNSTANDARDIZIED RAW SCORES
WHITE·MALES
WESCHLER VOCABULARY SUBTEST
24
32
40
48
56
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

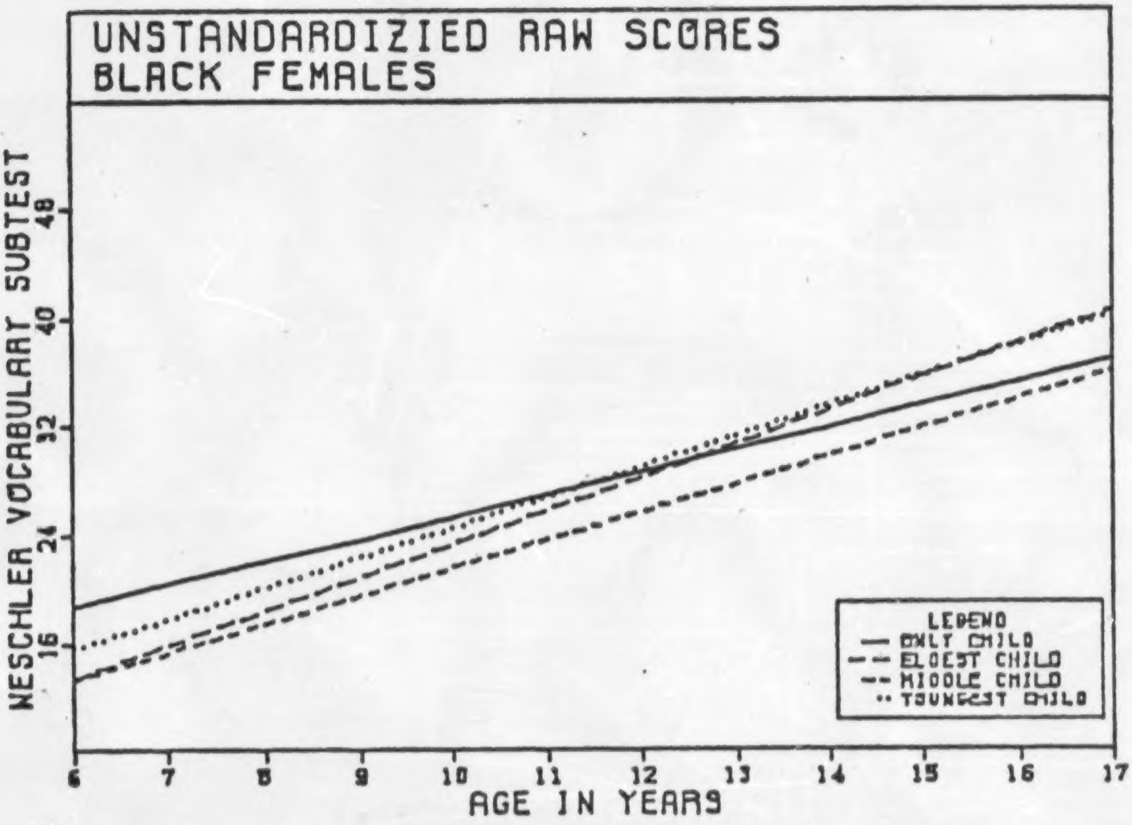

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WESCHLER VOCABULARY SUBTEST
16
24
32
40
48
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

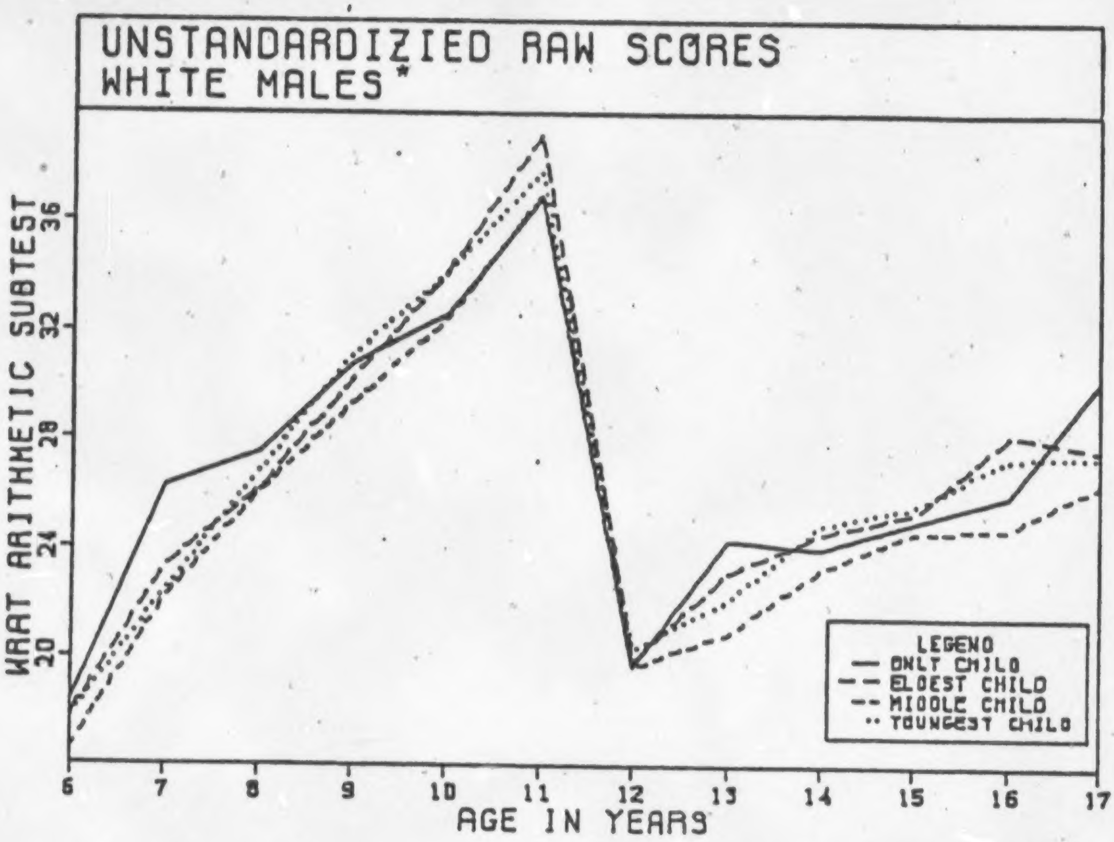

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WESCHLER VOCABULARY SUBTEST
16
24
32
40
48
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WESCHLER VOCABULARY SUBTEST
16
24
32
40
48
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WESCHLER VOCABULARY SUBTEST
24
32
40
48
56
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

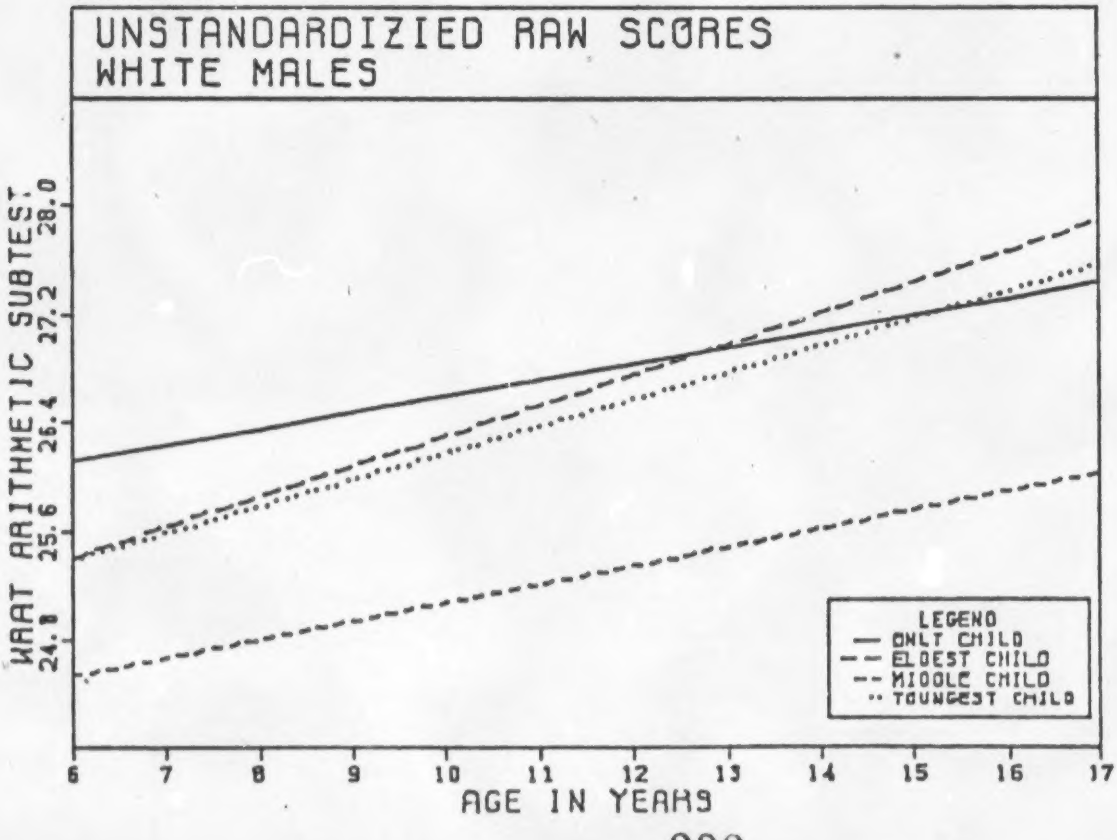

UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WESCHLER VOCABULARY SUBTEST
16
24
32
40
48
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WESCHLER VOCABULARY SUBTEST
16
24
32
40
48
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

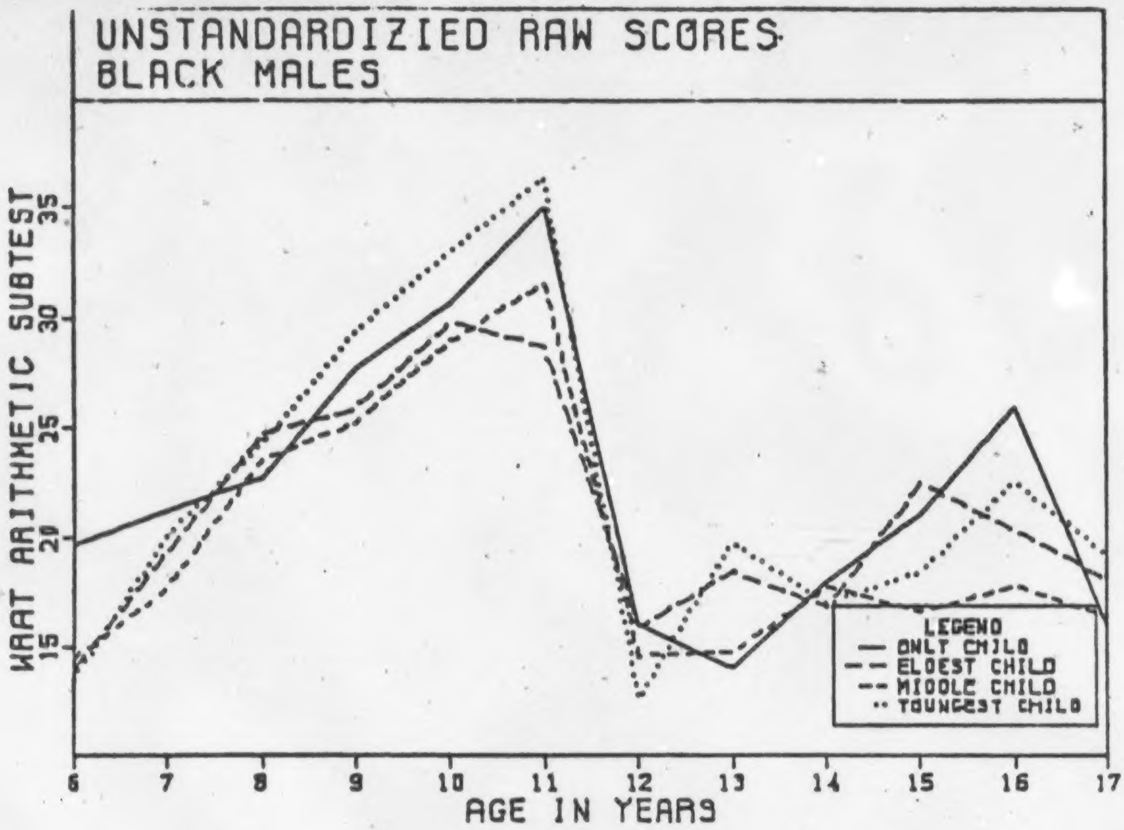


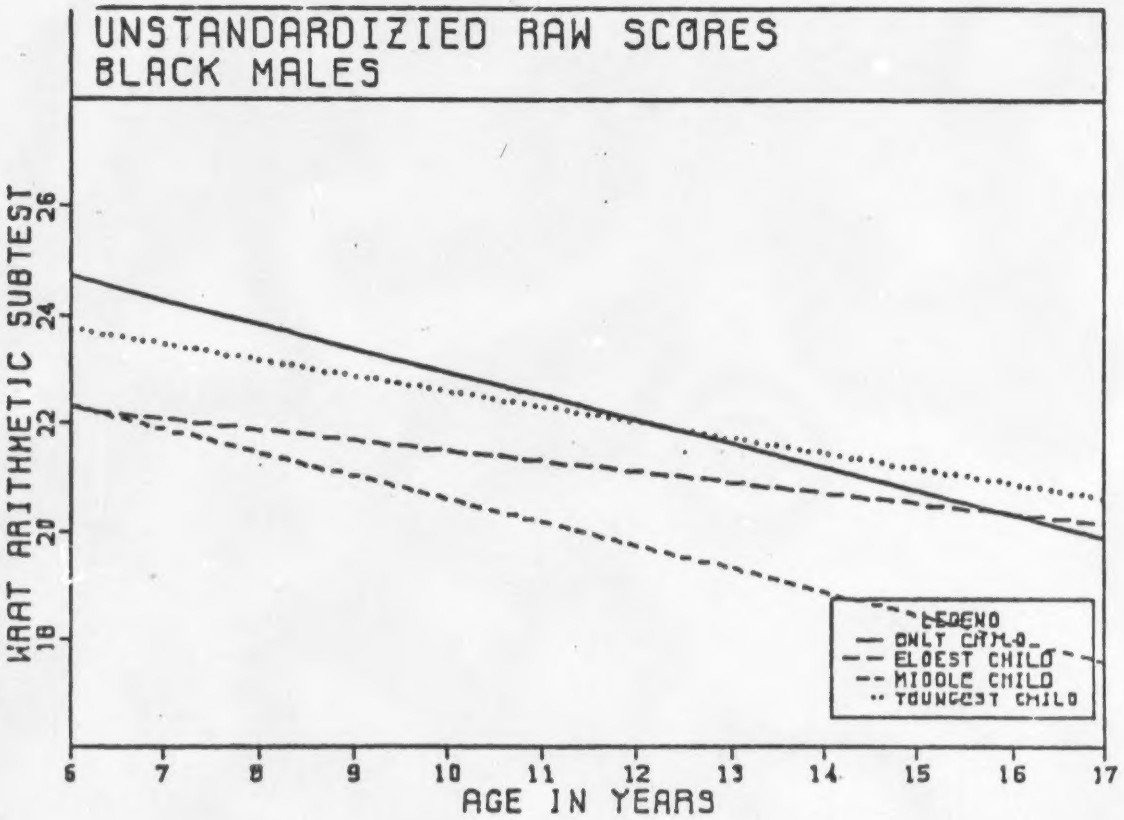
UNSTANDARDIZIED RAW SCØRES
WHITE MALES*

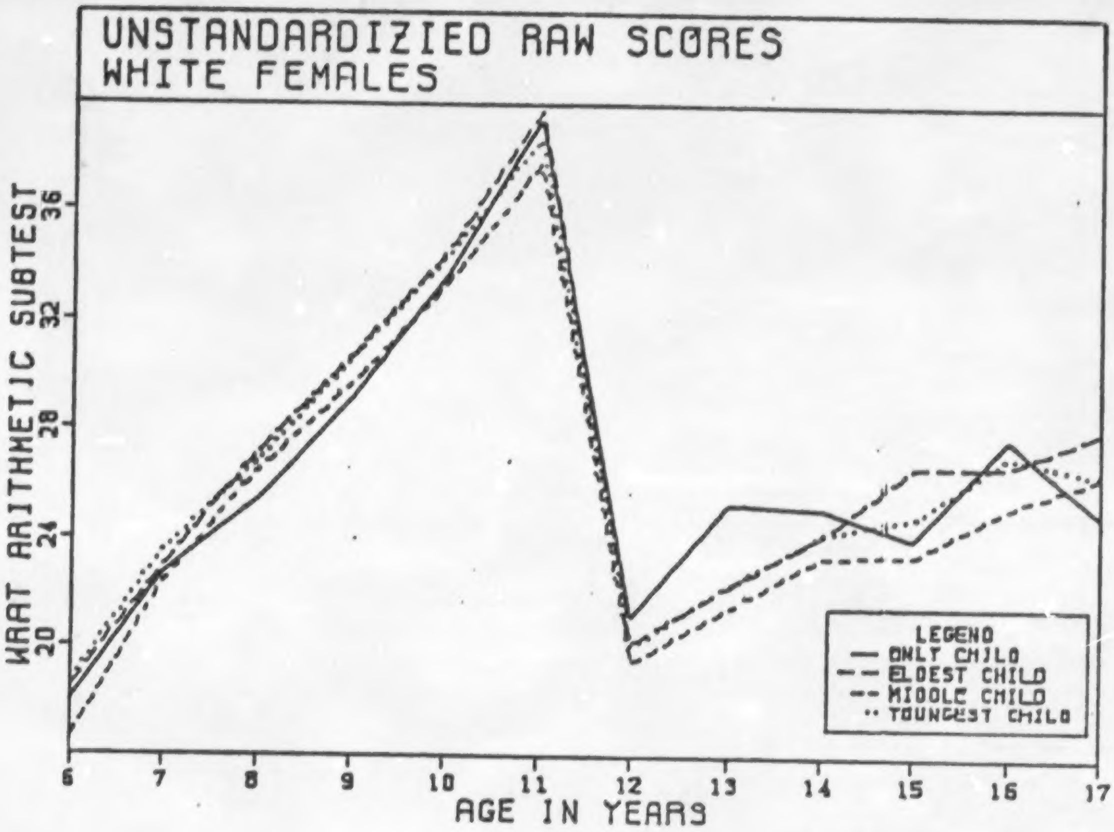
*This drop from age 11 to 12 is not real but is due to a different test for the youth than for the children, the youth test being made more difficult.

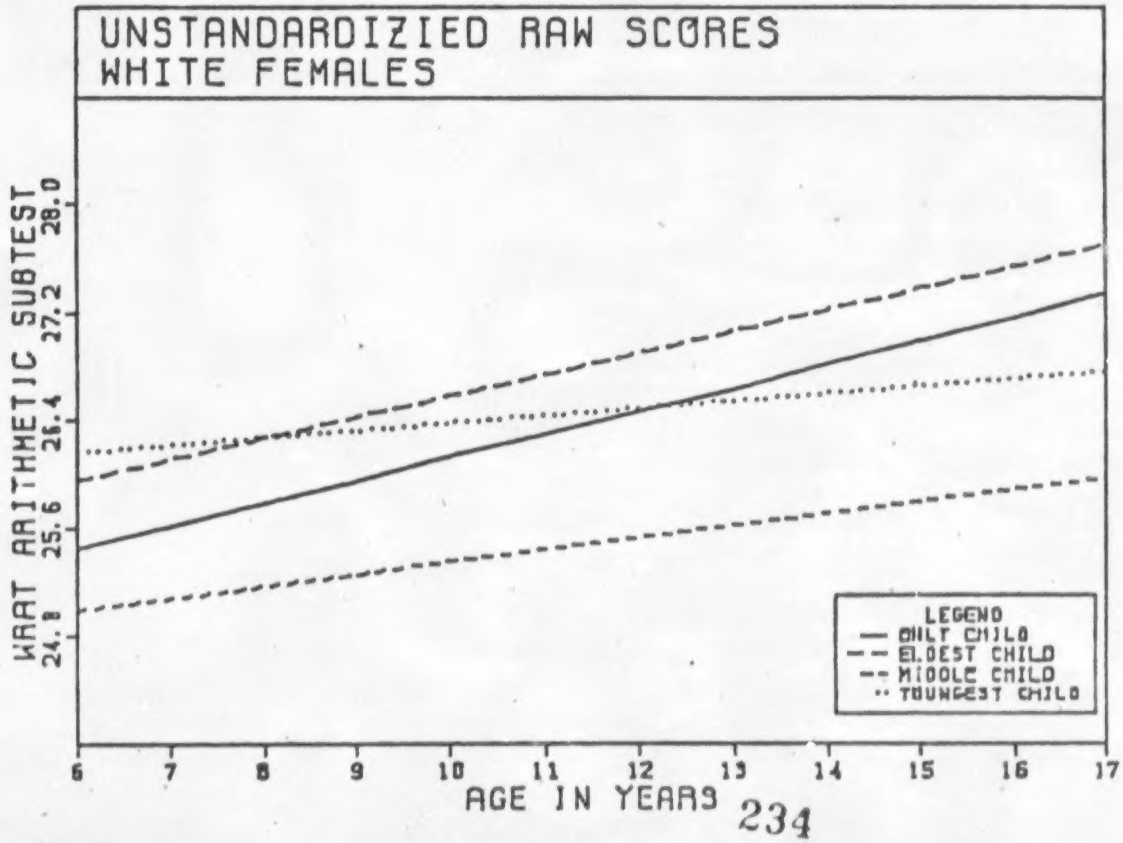


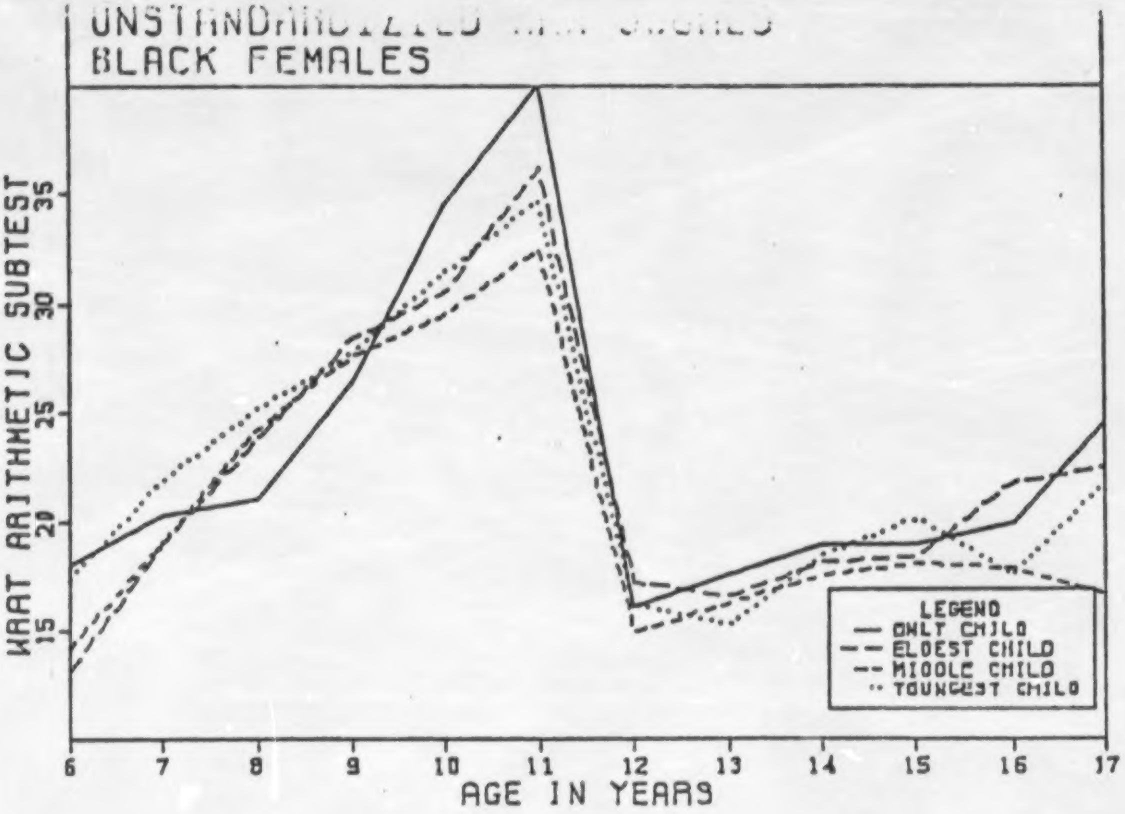
UNSTANDARDIZIED RAW SCØRES
WHITE MALES

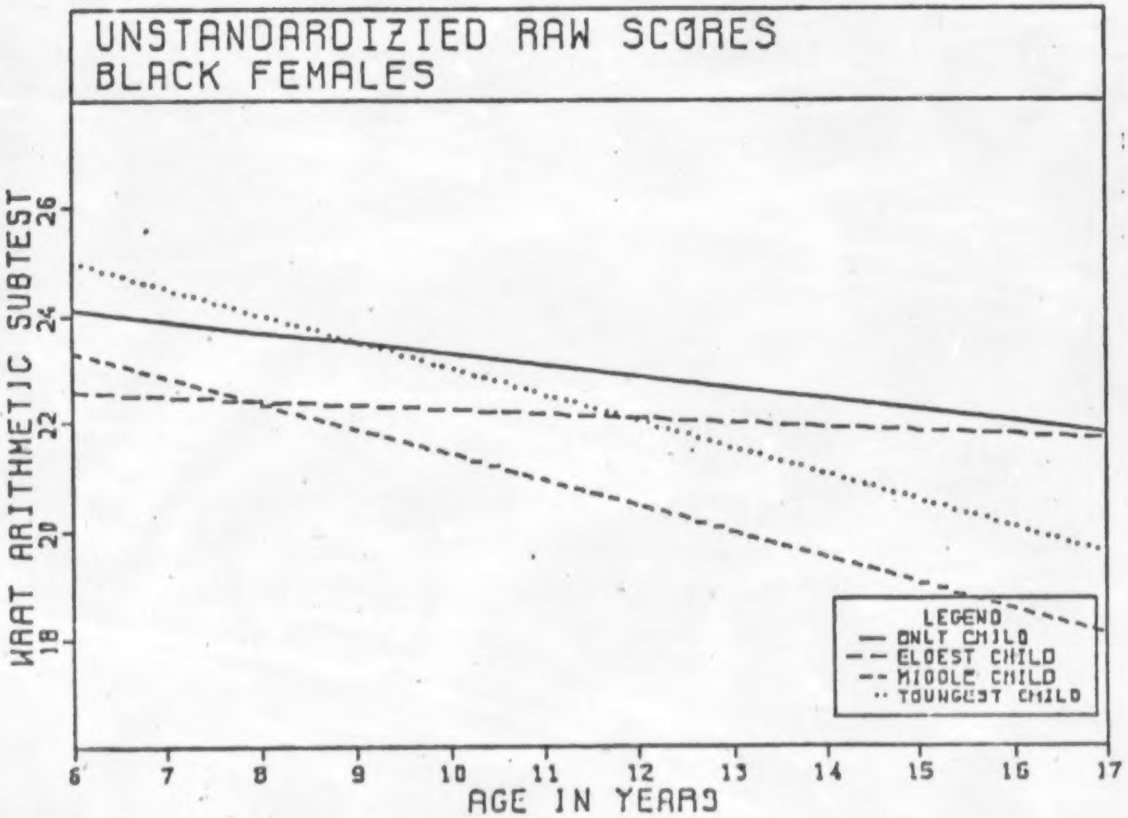

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WRAT ARITHMETIC SUBTEST
15
20
25
30
35
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

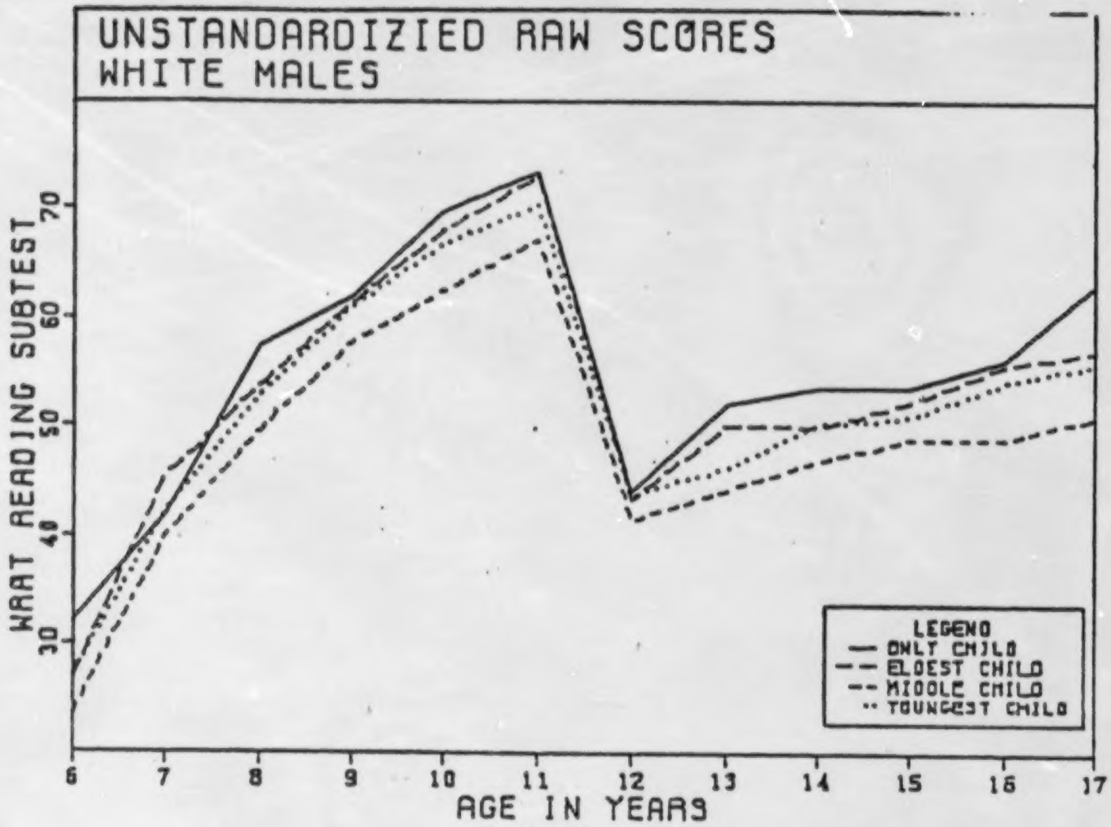

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WRAT ARITHMETIC SUBTEST
18
20
22
24
26
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

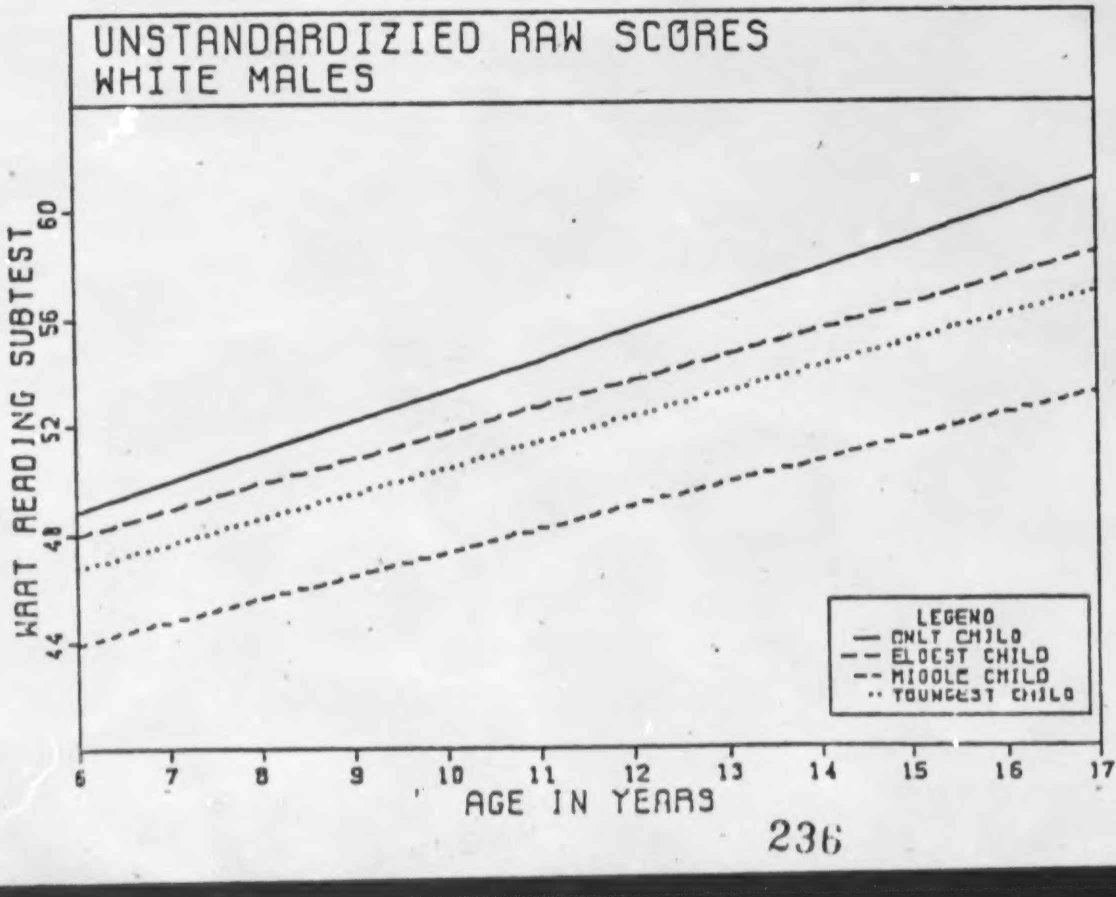

UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WRAT ARITHMETIC SUBTEST
20
24
28
32
36
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

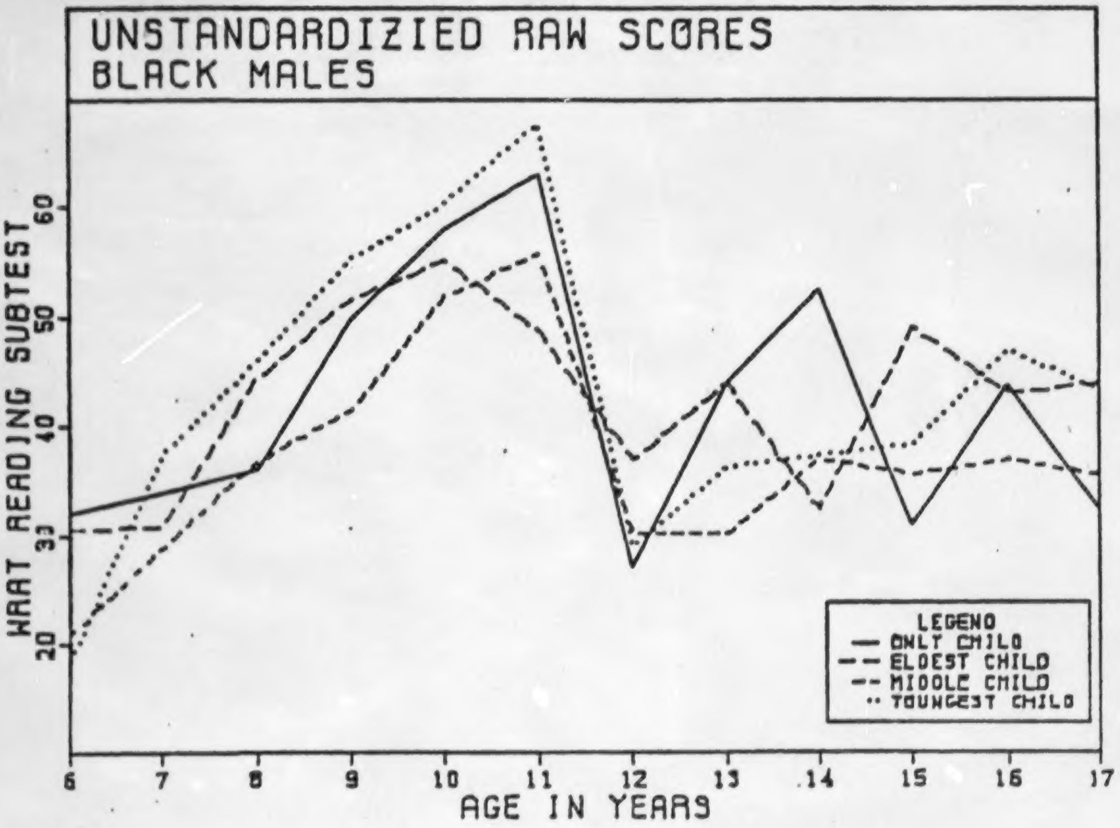

UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WRAT ARITHMETIC SUBTEST
24.8
25.6
26.4
27.2
28.0
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

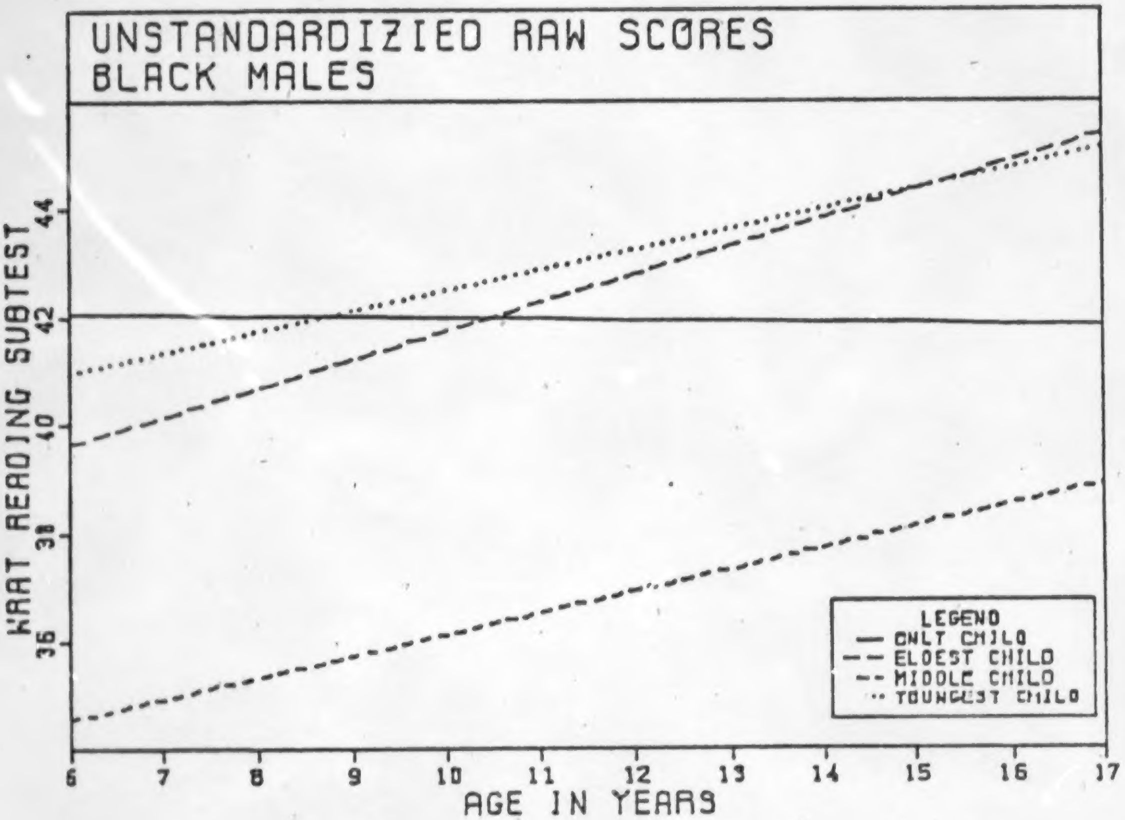

UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WRAT ARITHMETIC SUBTEST
15
20
25
30
35
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

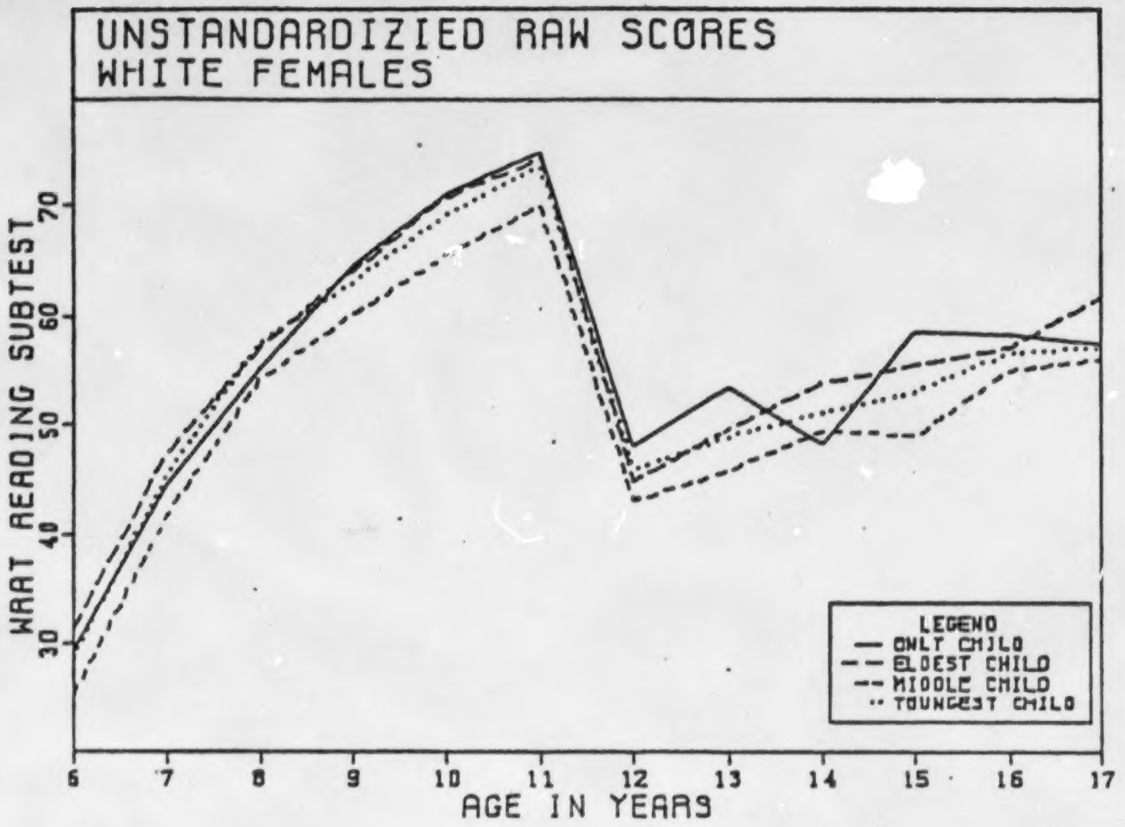

UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WRAT ARITHMETIC SUBTEST
18
20
22
24
26
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

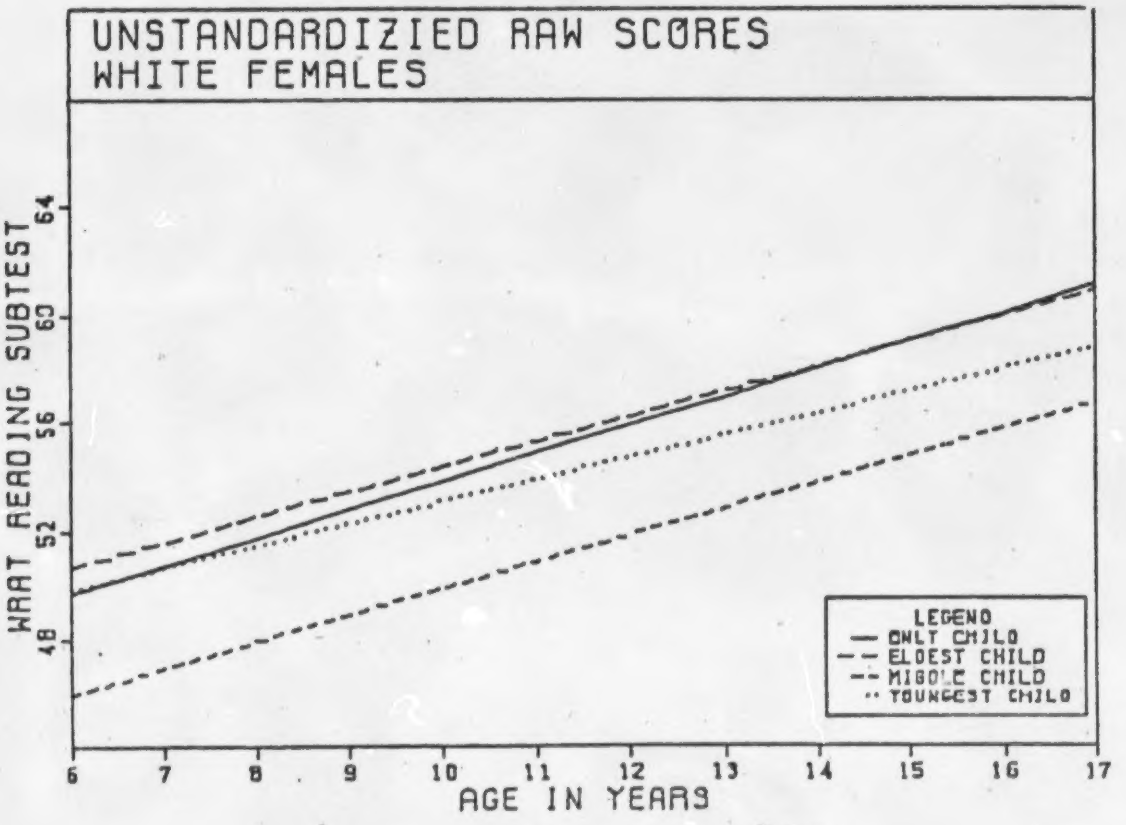

UNSTANDARDIZIED RAW SCORES
WHITE MALES
WRAT READING SUBTEST
30
40
50
60
70
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

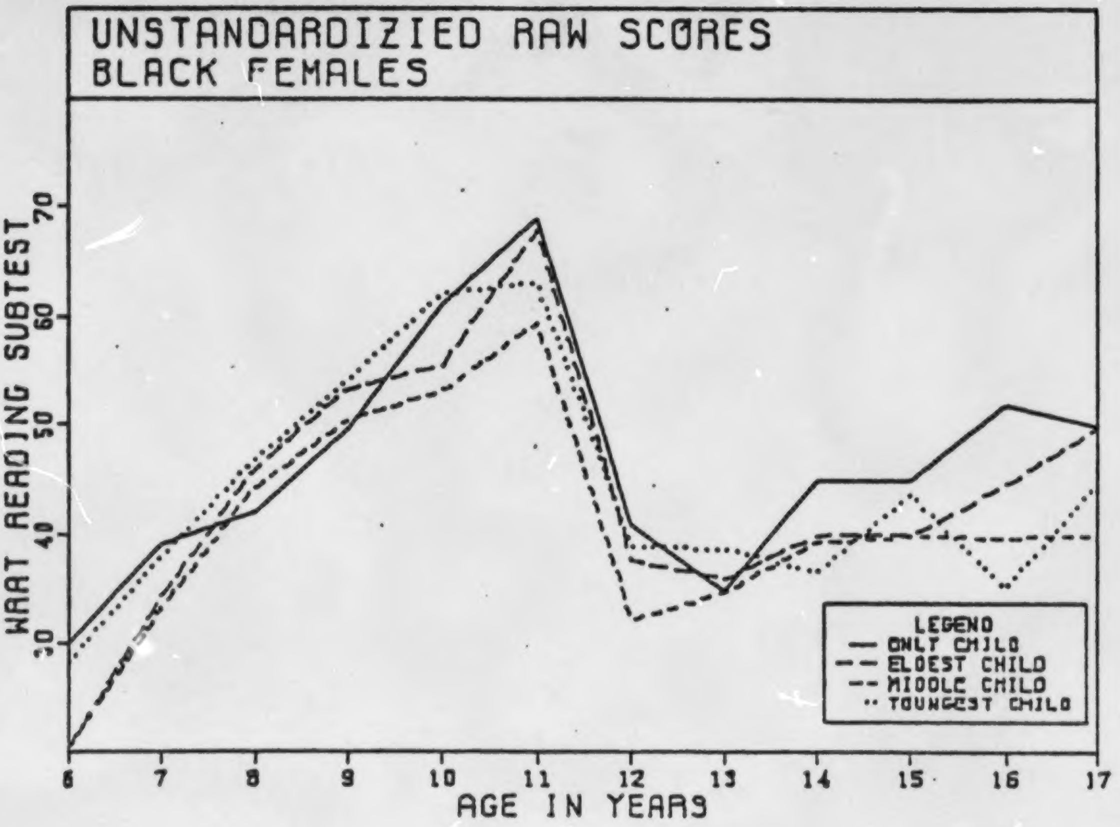

UNSTANDARDIZIED RAW SCORES
WHITE MALES
WRAT READING SUBTEST
44
48
52
56
60
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD

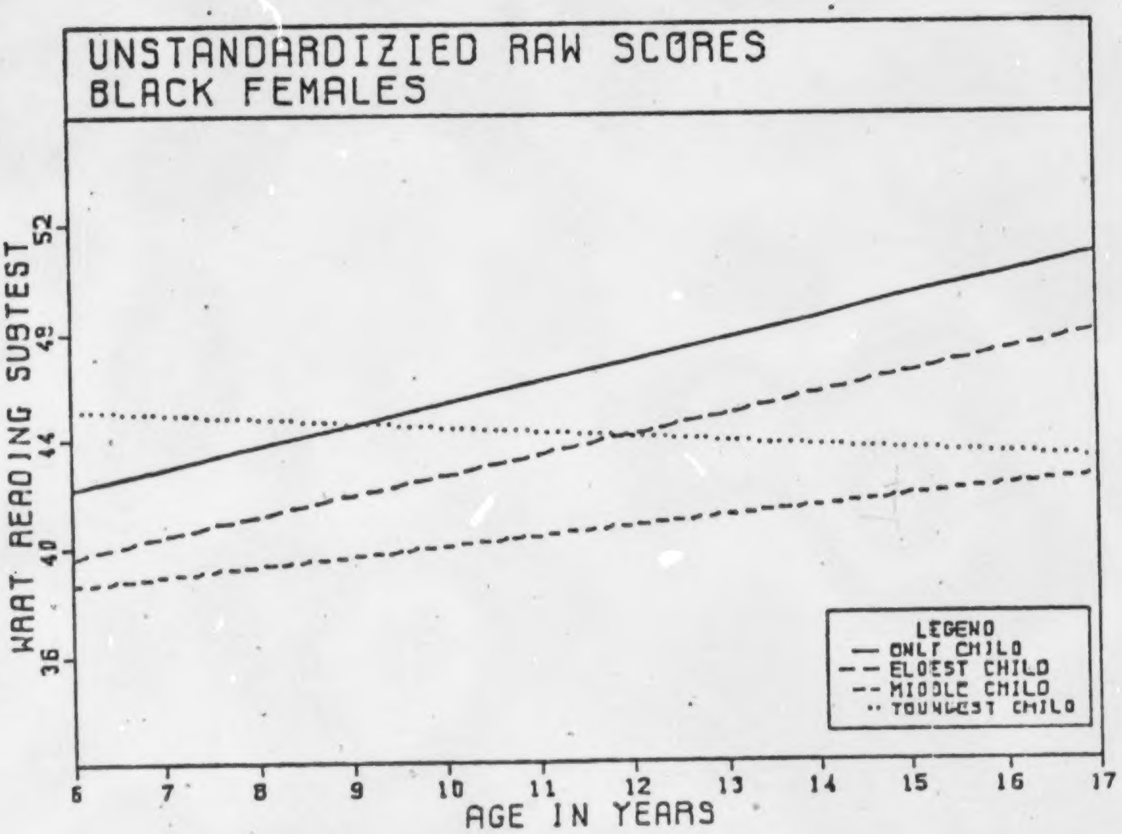

UNSTANDARDIZIED RAW SCORES
BLACK MALES
WRAT READING SUBTEST
20
30
40
50
60
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
BLACK MALES
WRAT READING SUBTEST
36
38
40
42
44
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WRAT READING SUBTEST
30
40
50
60
70
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
WHITE FEMALES
WRAT READING SUBTEST
48
52
56
60
64
6
7
8
9
10
11
12
13
14
15
16
17
AGE IN YEARS
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WRAT READING SUBTEST
30
40
50
60
70
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD


UNSTANDARDIZIED RAW SCORES
BLACK FEMALES
WRAT READING SUBTEST
36
40
44
48
52
AGE IN YEARS
6
7
8
9
10
11
12
13
14
15
16
17
LEGEND
ONLY CHILD
ELDEST CHILD
MIDDLE CHILD
YOUNGEST CHILD